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FOREIGN SECTION.

THIS portion of the Number, hitherto the Occasional Notes, has now become the Foreign Section, and is reserved for articles, either original or compiled, on professional subjects connected with Foreign Naval and Military matters; also for notices of Professional Books, either Foreign or English.

It is requested that articles, communications, and books for review (the latter under cover to the Librarian) may be addressed to me at the Royal United Service Institution, Whitehall Yard, London, S.W.

LONSDALE HALE,
Colonel R.E. ret.

COLONEL v. LÖBELL'S[1] ANNUAL REPORTS UPON THE CHANGES AND PROGRESS IN MILITARY MATTERS DURING 1891.

Compiled by Colonel H. HILDYARD.

THE reports relating to last year, published in Berlin in June, 1892, form the eighteenth issue of the series edited by Colonel v. Löbell each year since 1874. Their value is by this time so well known to all who are interested in military matters abroad, that it seems almost superfluous to call special attention to them again this year in addition to extracting from them, in a condensed form, the matter that seems to have the greatest interest for us. It may be, however, that some Officers who are interested in the subject, and who, by their knowledge of German, are able to go to the unabbreviated originals for their information, are unaware that there exists so complete a history of the formation and constitution of modern armies, and of the progress of military art in all its branches, as is contained in the eighteen volumes published since 1874 by Colonel v. Löbell. These are to be found in the library of the United Service Institution, and will form there, for all time, the most reliable record of the manifold changes in organization, armament, and tactics introduced during the two last decades. A summary—brief and necessarily incomplete—of the contents of each volume has been published, year by year, in the Journal of the Institution, in the hope that it might be found of some use by those unable to read the original. The number of these is happily becoming constantly less, and to Officers studying German Colonel v. Löbell's publications can be confidently recommended as a text-book for military literature.

The arrangement of the latest number issued does not differ from that adopted in previous years. The work is divided into three parts: the first of these deals exclusively with the organization, instruction, and progress of the numerous States that maintain a standing army; the second is devoted to the general consideration of the tactics of the several branches—infantry, cavalry, field artillery—and of fortress warfare, with treatises on military small arms, artillery matériel, and military literature; the third part is reserved for obituary notices on distinguished Officers of all nations. The summary that follows these introductory remarks deals only with the first two parts.

The reports for 1890, for reasons explained at the time, did not

[1] "Jahresberichte über die Veränderungen und Fortschritte im Militärwesen," 18 Jahrgang, 1891, herausgegeben von H. v. Löbell, Oberst z. Disp.—Berlin. Ernst Siegfried Mittler und Sohn. 1892. 1 vol. Pp. 500; size, 9·5″ × 6·5″ × 1″; weight 1 lb. 13½ oz. Price 9*s.* 6*d.*

include in the first part any notice either of the German or of the Swiss Armies. The omission has now been made good by the insertion this year of reports on these armies covering the whole period 1890–91. As a result of this arrangement the report on the German Army comprises 62 pages. That on the French Army comes next in point of length, with 36 pages; the Austrian Army has 31 pages; the British, 28; the Turkish, 27; and the Russian, 23. The reports on lesser States occupy the remainder of Part I, and it is noticeable that, with the exception of brief statements respecting the armed forces of Persia, Egypt, and the Congo State, the reports are restricted to the armies of European States. The reason for this is, no doubt, to be sought in the necessity for limiting the length of the work by the excision of such portions as are of least immediate interest. Exclusive of the third part, it comprises, as it is, 457 pages.

Germany.

Organization.—The year 1890 was a very important one for the development of the German Army. On the 27th January of that year a law was enacted introducing changes in the Imperial Military Law of the 2nd May, 1874, paragraphs 3 and 5 of which stood amended as follows:—

Paragraph 3.—"An Army Corps will be formed of two to three divisions with the corresponding artillery, pioneer, and train formations, so that the entire military force of the German Empire in peace will consist of twenty Army Corps. Two Army Corps will be formed by Bavaria, one each by Saxony and Wurtemberg, whilst Prussia in common with the other States will provide sixteen Army Corps."

Paragraph 5.—"The territory of the German Empire will be divided for military purposes into nineteen Army Corps districts. As a basis for the organization of the Landwehr, as well as for recruiting arrangements, the Army Corps districts will be divided into division or brigade districts, and these again into Landwehr and control districts (company districts, districts of chief recruiting offices, or recruiting offices), according to their dimensions and population."

The law came into force on the 1st April, 1890, by which time two new Army Corps had to be created by Prussia, the 16th Army Corps in Lorraine and the 17th Army Corps in West Prussia. The Staffs for both corps for the corps commands, divisions, infantry, cavalry, and field artillery brigades and field artillery regiments were formed. but the troops were taken from previously existing formations. For example, the fifteen 4th infantry battalions were converted into five new infantry regiments, and distributed to different Army Corps.

The new Army Corps were formed by drafting from other regiments to compose the the 33rd, 34th, 35th, and 36th Infantry Divisions; cavalry brigades and field artillery brigades and regiments were created in the same way.

The second important step towards the development of the Army was inaugurated by the Law of the 15th July, 1890, regulating the peace strength. It ran as follows:—

"Para. 1. The peace strength of the German Army with the colours is fixed at 486,983 men for the period between the 1st October, 1890, and the 31st March, 1894. The one-year volunteers are not included in the peace strength with the colours."

"Para. 2. From the 1st October, 1890,

"The infantry will be formed in		538 battalions.
„ cavalry	„	465 squadrons.
„ field artillery	„	434 batteries.
„ foot artillery	„	31 battalions.
„ pioneers	„	20 battalions.
„ train	„	21 battalions."

By this measure an increase of 4 battalions, 74 batteries, 1 pioneer battalion, and 3 train battalions was made to the Army. The general result of the increase to the field artillery has been to give to each Army Corps 2 field artillery regiments of 7 brigade divisions, 6 of which are composed of 3 batteries of field and the remaining 1 of 2 batteries horse artillery. Some Army Corps have more: the Guard and 1st Bavarian Corps, for instance, have 2 brigade divisions of horse artillery, besides 6 of field. The 1st, 3rd, 5th, 17th have 7 brigade divisions of field artillery, besides 1 of horse; the 12th and 2nd Bavarian Corps have 9 brigade divisions of field, besides 1 of 3 batteries of horse, artillery.

A Railway Brigade, of two railway regiments, has been formed from the previously existing Railway Regiment. The 1st Regiment is composed of the former 1st and 2nd battalions; the 2nd Regiment of the 3rd and 4th battalions. The balloon section is attached to the 1st Regiment.

The train battalions (or companies) are placed entirely under the Army Corps command, and within this under the field artillery brigades. In connection with this change, the train inspection is done away with and a train depôt inspection is created.

Two Inspectors of Cavalry have been appointed with the rank of Lieutenant-Generals. Their functions are to conduct the special cavalry exercises that are held yearly, and the tactical tours made, by the Emperor's orders, by cavalry Generals and Staff Officers. For these duties the Inspectors are placed directly under the Emperor, to whom they are to report. The Emperor reserves to himself the right, on the representation at any time of the Minister of War, to employ the Inspectors to inspect, with the Inspector of Remounts, the horses of any body of troops.

The Inspectors are made members of the Cavalry Committee created at the same time. The other members are the Commander of the Guards Cavalry Division, two Officers of the Ministry of War, an Officer of the General Staff, an Officer of the field artillery to be detailed by the Minister of War. The senior General acts as Chairman of the Committee. The temporary increase of the Committee by the Inspector of Remounts, an Officer of the Military School of Equitation, by regimental Officers, the Inspector of the Military

Veterinary Service, by members of the Stud Department, &c., is arranged as required by the Minister of War.

Command of the Train.—The following instructions were issued in connection with the changes effected in the command and inspection of the train. The functions of the previously existing Inspector of Train pass to the General Commanding the Army Corps, and under him to the Commanders of field artillery brigades, so far as the following points are concerned:—

1st. The conduct of the arrangements connected with the personnel, exclusive of the train depôt Officers.

2nd. The inspection of horses, the clothing, arms, and equipment, exclusive of field stores and exercise matériel.

3rd. The conduct of the training and supervision of the duties.

The field artillery brigade Commanders preside at the committees of inspection for the train battalions.

The Train Depôt Inspectors are charged with the following duties:—

1st. The conduct of matters connected with the personnel of the depôt.

2nd. The inspection and completion of the field stores and exercise matériel.

3rd. The submission of proposals for the improvement of the matériel and the conduct of experiments.

4th. The superintendence of the depôt administration.

The Train Depôt Inspector has the rank of a regiment Commander. He is subordinate to the Director of the branch at headquarters.

Colonial Defence Force.—By a law of the 22nd March, 1891, a special defence force for German East Africa was created. The duties of the corps to be raised were specified as being the maintenance of public order and security in German East Africa, especially the supression of the slave trade. The force was to be composed:—(1) of Officers, military engineers, medical Officers, officials, and non-commissioned officers of the Imperial Army and Navy who volunteered for it; (2) of enlisted natives. Those volunteering from the Army cease to belong to it on joining the defence force. The numbers of the force are:—

Germans.—30 Officers.
10 Surgeons.
1 intendant.
12 pay officials.
1 superintending armourer.
10 serjeants-major.
34 non-commissioned officers.
18 sick attendants.
2 armourers.

Natives.—12 Lieutenants.
50 non-commissioned officers.
1,500 privates (organized in 10 companies).

Recruiting.—The following table shows the number of recruits per unit taken for service with the colours in 1890 and 1891 respectively in the Prussian troops. The difference was approximately the same in the two Bavarian corps:—

	1890.	1891.
To each battalion of infantry on the higher establishment	230	244
„ „ „ „ medium „	..	228
„ „ „ „ lower „	200	209
„ „ jägers „ higher „	..	232
„ „ „ „ medium „	190	216
„ „ „ „ lower „	..	199
„ cavalry regiment „ higher „	150	160
„ „ „ medium and lower estab.		150
„ horse artillery battery „ higher establishment	35	35
„ „ „ medium „	..	32
„ „ „ lower „	25	25
„ field battery „ higher „	35	38
„ „ „ medium „	..	35
„ „ „ lower „	30	30
„ battn. of foot artillery „ higher „	200	210
„ „ „ lower „	160	168
To the Guards pioneer battalion	210	221
To other pioneer battalions	164	172
To each battalion of the Railway Regiment	135	135
To the Balloon section	15	15
To each company of the Baden Train Battalion No. 14 and of the Train Battalion No. 15, for 3 years' active service	15	18
Ditto for 6 months' active service in the autumn and spring		38
To each company of the other train battalions, for 3 years' active service		15
Ditto for 6 months' active service in the autumn and spring	38	38

Training of Men not with the Colours.

i. *Belonging to the Reserve and Landwehr.*

Distribution.	1890–91.		1891–92.	
	Prussians, &c.	Bavarians.	Prussians.	Bavarians.
Cavalry	6,900	720	5,280	720
Field artillery	7,524	900	7,536	902
Foot „	3,800	850	3,800	700
Pioneers	2,300	665	2,300	665
Railway troops	400		600	
Balloon section	20	..	20	
Train	5,517	896	5,320	882
Totals	26,461	4,031	24,856	3,869

The period of training was: for the cavalry 28 days, for the balloon section 21 days, for the train as specially ordered, and for the rest 12 days.

ii. *Belonging to the Ersatz Reserve. For a first* (10 *weeks'*) *Exercise.*

Distribution.	1890-91.		1891-92.	
	Prussians, &c.	Bavarians.	Prussians, &c.	Bavarians.
Infantry	9,610	1,500	9,610	1,500
Jägers	300	50	300	50
Foot artillery	1,150	200	1,150	200
Pioneers	630	90	630	84
Train	810	120	810	120
Total	12,500	1,960	12,500	1,954
For a second (6 *weeks'*) *Exercise.*				
Infantry	8,730	1,310	With the exception of the train, all the Ersatz Reservists who in 1890-91 had undergone respectively their first or second training were out	
Jägers, &c.	270	46		
Foot artillery	950	170		
Pioneers	550	74		
Total	10,500	1,600		
For a third (4 *weeks'*) *Exercise.*				
Infantry	8,060	1,210	in 1891-92 for their second or third training.	
Jägers	240	40		
Foot artillery	800	140		
Pioneers	400	60		
Total	9,500	1,450		

Belgium.

Peace Organization.—The following changes have taken place in the constitution of infantry divisions and brigades in consequence of the completion of the works on the Meuse:—

Divisions.	Brigades.	Regiments.
1st Division (Ghent)	1st brigade	1st and 2nd Line Regiments.
	2nd „	3rd and 4th „
2nd „ (Antwerp)	3rd „	5th and 6th „
	4th „	7th and 8th „
3rd „ (Liége)	5th „	9th, 10th, 13th „
	6th „	11th, 12th, 14th „
4th „ (Brussels)	7th „	1st and 2nd Jägers.
	8th „	3rd Jägers, grenadiers, carbineers.

From this new distribution it will be seen that the number of brigades has been reduced by one.

The extraordinary budget for 1891 provided for the expenditure of between 23 and 24 millions of francs on barracks, defensive works, and fortress artillery; the greater portion of the money was allotted to the works on the Meuse. A serious debate took place on the subject in the House of Representatives. The expenditure on these works, which was in 1887 estimated at 24 millions of francs, gradually increased to 32 millions and then to 54 millions. In 1891 the faulty estimate was seen to be worse still, for the calculated expenses gradually rose to 61 and then to 71 millions. To the latter sum had to be added the compensation to be paid to the occupiers and the collieries on the Meuse banks.

The works are now practically completed. Some of the forts are occupied by batteries of the 8th Artillery Regiment, and the 13th and 14th Line Regiments will shortly garrison Liége and Namur. The armament of the forts has still to be completed. It is stated that by next spring all the guns will be mounted.

From a statement by the Minister of War it appears that, with the exception of a few redoubts at points the occupation of which is considered to be of special importance, no work is to be constructed at Antwerp that can be compared in importance with those existing.

Bulgaria and East Roumelia.

Peace Organization and Strength.—

Infantry, 24 regiments each of 2 battalions.
Cavalry, 4 regiments of 4 squadrons.
Body Guard, 1 squadron.
Artillery, 6 regiments of 2 batteries 9-cm., 2 batteries 8-cm., 1 battery 7-cm. (Of the 30 batteries, 24 are field and 6 mountain.)
Pioneers, 6 battalions of 2 companies.
Field telegraph, 1 company.
Field railway, 1 company.
Siege battery, 1.

In the summer of 1891 the peace strength was the following:—

1st Infantry Brigade	(Sofia).....	4,170	men.
2nd „	(Widdin)	3,952	„
3rd „	(Rustchuk) ..	3,769	„
4th „	(Schumla)	3,700	„
5th „	(Philippopel)..	3,897	„
6th „	(Slivno).....	4,092	„
Total infantry		23,580	„
Cavalry.....		2,910	„
Artillery		4,487	„
Technical troops.....		1,600	„
Flotilla.....		340	„
Total all arms		32,917	„

And about 1,460 Officers.

War Organization.

Infantry.—Each of the 24 regiments forms a 3rd, 4th, and a depôt battalion; together 96 field and 24 depôt battalions.

There are further 26,003 men of the 1878 and 1879 recruiting classes, who, having served 18 months with the colours, have, since 1887 or 1888 respectively, belonged to the Opoltschenie. From these men 24 Reserve battalions are formed.

The infantry, therefore, would consist of:—

Field battalions	96
Reserve field battalions....	24
Depôt battalions.....	24
Total battalions	144

Cavalry:—Each of the 4 regiments gives 2 Officers and several non-commissioned officers who form the nucleus for the formation of 6 new squadrons.

Artillery:—The existing 6 regiments remain unaltered; 3 regiments each of 4 batteries are formed from the 3 Reserve cadres.

The higher organization is the following:—

6 infantry divisions, each composed of 16 field battalions, 1 artillery regiment, and 1 squadron (of the 6 newly formed squadrons).

3 infantry Reserve divisions, each consisting of 8 Reserve battalions and 1 Reserve artillery regiment.

1 cavalry division of 4 regiments.

War Strength.—The following trained men are available on mobilization towards completing the formations specified above:—

	Infantry.	Cavalry.	Artillery.
1. With the colours (classes 1890–91)..	23,580	2,910	4,487
2. Reserve (classes 1880–89)	84,210	5,107	8,300
3. Opoltschenie (classes 1878–79)	26,000	—	—
	133,790	8,017	12,787
		154,594	

But after deducting 5 per cent. from these paper numbers, about 6,000 more men will be required to complete the requirements of the infantry. There is no difficulty about getting these from the untrained or only partially trained men of the Opoltschenie, who number, exclusive of the 26,000 men of the trained portion, 161,700, of whom 73,000 are between 20 and 30 years of age. The remaining 88,700 are between 30 and 40.

Officers.—In order to provide each inferior unit of the mobilized force with four Officers only, there would be required 2,500 for the infantry, 100 for the cavalry, and 180 for the artillery. Exclusive, therefore, of the special branches, administrative services and Staffs, about 3,200 Officers would be required. The number available does not exceed 1,400; less than a half of the actual requirements.

Small Arms.—There are three patterns, viz.:—

Mannlicher (Austrian pattern).....	90,000
,, ordered for delivery	30,000
Berdan II.....	50,000
Krnka	100,000
Total.....	270,000

After the consignment ordered of the Mannlicher arm has been received, it will become possible to arm the whole of the 120 field battalions with this magazine arm. The 24 depôt battalions and the Opoltschenie would be armed with Berdan and Krnka rifles. An order has been placed in Vienna for 70 millions of Mannlicher cartridges. Krnka ammunition in sufficient quantities is in hand; but this is not the case with Berdan ammunition. Guns have been ordered from Krupp for the three reserve artillery regiments, which would, if mobilized before their delivery, have to fall back on the 9-pr. bronze guns (12-cm.) left by the Russians.

Denmark.

Defences of Copenhagen, Land Side.—The land defences will practically be completed by the construction of the new works commenced last year. These are the following:—

1. On the left flank of the works, in the immediate vicinity of Kalvebodstrand, a coast battery, the guns of which will fire seawards.
2. On the right flank of the works, on the east flank of the

Christiansholm's lines, an open coast battery, the guns of which will fire seawards.

The fort of Garderhöj, built by public subscription, is completed, and will be fully armed in the course of a few months. The fort at Gammelmosegaard, commenced by public subscription and taken over subsequently by the State, was completed in 1891 and is nearly ready for its guns.

France.

Amongst the changes that have taken place during 1891 are to be noticed the new formation of 3 cavalry and 1 infantry regiments, the addition of a 4th battalion to each of the infantry regiments from No. 145 to No. 162, and of a 5th battalion and a depôt company to each of the two foreign regiments. A Bill was presented to Parliament for the formation of a Colonial Army, to which would belong both the existing marine infantry and marine artillery, the whole to be under the Minister of War so as to ensure a closer connection between it and the Regular Army. The principle of a Colonial Army for the protection and defence of the French Colonies and Protectorates, exclusive of Tunis, was provided for in the Organic Law of the 15th July, 1889. The proposals for carrying out this principle that were laid before the Chamber of Deputies last year were framed by a Committee composed of representatives of the Ministries of War, Marine, Home, and Colonies under the presidency of Lieutenant-General de Miribel, Chief of the General Staff.

Recruiting, 1890.—The statistics on this subject are of special interest, because 1890 was the first year in which the new arrangements for levying and distributing the annual contingent of recruits, under the Organic Law of 1889, came into force. The numbers to be dealt with were composed of men forming the 1889 annual class, and those of the 1888 and 1887 classes who had been put back the previous year. The 1889 class consisted of 310,275, 14,500 more than in the preceding year, amongst them 5,315 sons of foreigners, rendered liable by the Law of 1889; 8,683 failed to appear; 29,260 were pronounced to be unfit for any sort of service. This left 280,655 to be dealt with, of whom—

140,718 for 3 years' service.
44,316 „ 1 „

But there had further to be deducted—

32,741, who had already entered the Army,
39,997, put back,
22,792, fitted only for the administrative services,
91, excluded by reason of bad character.

And to be added—

19,592 of the 1888 and 1887 classes who had been put back.

Finally, the actual numbers liable and fit to bear arms resolved themselves into 204,986, viz. :—

134,056 for 3 years' service.
19,315 „ 2 „
60,615 „ 1 „

To these have to be added the men enlisting voluntarily, viz. :—

3,267 in the Navy,
7,691 „ marines,
25,267 „ Army,
5,103 „ foreign troops.

Thus the total strength of the year's contingent was, in round numbers, 242,700 men. At this rate nearly a million of men would be trained to arms in France in the course of four years. Of the 310,275 on the lists, 26,051 could neither read nor write, 32,689 could read, but not write. The average height was 5 ft. 4·72 ins., showing a very slight diminution on previous years.

Reserves.—L'Avenir Militaire (No. 1606, 14th August, 1891) reckons the whole strength of the Reserves to the Active Army, after making the usual deductions, at 1,248,000 men, and that of the Reserve to the Territorial Army, after the Organic Law of July, 1889, shall have been in force for twenty-five years, at 1,659,000 men. Including the 570,000 men with the colours, 1,181,000 men belonging to the Territorial Army, and the untrained men drafted on mobilization to the administrative services, the entire war strength of the French Army at the same period is estimated at 5,564,000 men.

The Reservists of 1883 and 1884 were called out for drill as follows :—

Infantry—

25th August to 21st September.	Reservists of the 1st, 2nd, and 3rd battalions, rifle battalions, Zouaves, Algerian tirailleurs. The drivers of S.A. ammunition wagons, who are non-commissioned officers, not employed at manœuvres in this capacity, were attached to an artillery regiment for the training.
7th April to 1st May.	Reservists of infantry not belonging to a corps.
1st October to 28th October.	Reservists belonging to the 4th battalions who have to take part in the drills of the "mixed" regiments.

Cavalry—

17th March to 13th April.	In two series.
14th April to 11th May.	

Field Artillery—

12th October to 8th November.

Foot Artillery and Engineers—
25th August to 21st December.

The Reservists of the train, administration, artillery artificers' companies, and the gendarmerie are all called up as found most convenient.

For the first time Generals Commanding corps were empowered to call up by personal notice a certain number of Reservists between the 1st April and the end of August, for a period of twenty-eight days.

The numbers to be called out, and for whose training provision was made in the Budget, were as follows:—

Infantry.....	4,375 Officers	225,107 men.
Administrative troops..	—	19,802 „
Cavalry	305 „	12,987 „
(Exclusive of 100 veterinary Officers.)		
Artillery.....	255 „	55,939 „
Engineers	173 „	7,076 „
Train	160 „	18,550 „

During the time of the training of the Reserves, provision was also made for the following to take part in special exercises with troops of the Active Army:—

45 Officers and 70 Surgeon-Majors with the cavalry.
1,540 Officers (only Sub-Lieutenants) and 38 Surgeon-Majors with the artillery.
35 Officers (only Sub-Lieutenants) with the engineers.

Cavalry Carbine.—The whole of the cavalry, including the cuirassiers, is in the course of being armed with a small-bore carbine, of new pattern. According to the press, the magazine is arranged for 3 cartridges. Each man is to carry 100 cartridges.

Defensive Works.—The following have been removed from the list of fortified places:—By the Law of the 27th January, the fortress of Douai, and the fort of La Scarpe; by the Law of the 2nd July, the fortress of Arras with its citadel, the redoubt of St. Catherine, and the smaller works appertaining to it.

At Belfort new works have either been planned or are in course of construction. According to statements in the Progrès Militaire, No. 1136 (23rd September, 1891), six new infantry works are to be constructed on the right banks of the Savoureuse, which will serve to strengthen and support Fort Salbert. They are to be situated in the vicinity of this fort and between Forts Vaudois and Giromagny, and offer safe cover to infantry inside the girdle of forts. The girdle road connecting the forts with one another and with the enceinte has been made. The removal of the portions of the enceinte that have been rendered unnecessary, owing to the construction of new works, has been commenced.

The military press reports further respecting the extension and strengthening of the fortresses on the eastern frontier. At Verdun also a new fort, St. Symphorien, has been constructed on the south front, one at Landrecourt, on the left bank of the Meuse, and several smaller works.

In the Alps, Fort Queyras has been built and furnished with covered batteries.

A strengthening of the fortifications of Cherbourg is in contemplation, and plans have been drawn up for the construction of new forts for the protection of the harbour, the town, and the fleet.

Railways.—Of the new lines completed and taken into use in 1891, those noted below are of special interest, from a military point of view.

1st. The section St. Florentin—Troyes of the great strategic line that connects Bourges by way of Auxerre and Troyes with the east frontier; the section Bourges—Clamecy is still in course of construction.

2nd. The section Lons-le-Saulnier to Champagnole, near the Swiss frontier.

3rd. The section as far as Brézel of the line Digne—Nice, which connects Lyons with Nice, by way of Grenoble.

A line of great strategic importance which will connect Paris directly with Rheims, is, according to the Progrès Militaire, No. 1122, being constructed. It branches off at Trilport from the section Paris—Châlons-sur-Marne, passes by La Ferté-Milan and Parmentiers, and joins at Basoches in the valley of the Vasle with the line from Soissons to Rheims. The establishment of a second communication by rail between Toul and Nancy—the previously existing one goes round by Frouard—was undertaken last autumn. It branches off from the section Nancy—Mirécourt at Pont-St. Vincent, and runs directly thence to Toul; the line is double.

Staff.—A Decree of the 3rd January, 1891, completed that of the 6th May, 1890, on the subject of the constitution of the Staffs of the Army.

1st Part.—Service in Peace.—The following belong to the Staffs:—

1st. The "Maison Militaire" of the President and the Staff of the War Minister.

2nd. The General Staff of the Army.

3rd. The Staffs of the Military Governments of Paris and Lyons.

4th. The Staffs of Army Corps, divisions, infantry and cavalry brigades.

5th. Those of territorial divisions and brigades.

6th. The Officers attached to the Marshals of France, and to certain General Officers specially employed.

7th. The Officers attached to Embassies abroad.

8th. The Staffs of artillery and engineer commands.

To the General Staff belong:

i. Certificated Officers (of proved fitness for the duties of the General Staff) who are placed *hors cadre;*

ii. Twelve superior Officers, who form the cadre for survey services;
iii. Officers selected for employment in special situations and detached from their corps;
iv. Archivists.

A General of Division is placed at the head of the General Staff as its Chief, with Brigade Generals and Colonels as Sub-Chiefs.

The other Staffs are composed of certificated Officers placed *hors cadre*, of certificated Officers detached from their corps, of orderly Officers, and Archivists.

The Chief of the General Staff is charged under the authority of the War Minister with the superintendence of all matters connected with General Staff services. Under him are placed all the certificated Officers and those uncertificated Officers employed on the Staff, the Archivists and interpreters; the whole of the personnel of the Geographical Service; the superior War Schools (exclusive of the students); those Officers of the Reserve and the Territorial Army who in time of war would be employed on the Staff; the Étappen, or railway services. His sphere extends further to superintending the training of the General Staff Officers, and to matters connected with the Geographical Service and the superior War Schools.

Every year the War Minister settles and publishes the conditions of entry to these schools. The course lasts two years, at the conclusion of which the examinations for the certificate are held. All the Officers who obtain the certificate are attached for two years' duty with the Staff; during this time they have two exercises with troops of those arms to which they do not belong. Superior Officers and Captains are permitted to undergo special examinations for the certificate without having passed through the school.

The Colonels, Majors, and Captains of the General Staff, who are certificated, have directly on their promotion to the ranks named to do regimental duty in their rank for two years. The 12 superior Officers employed in the Geographical Section are alone exempted from this rule.

The orderly Officers on the Staffs of General Officers are to be taken from certificated Captains and Lieutenants.

The Chief of the General Staff of an Army Corps is responsible for the service of the Staff, and for the training of the Officers placed under him. The Sub-Chief is the assistant and representative of the Chief. A superior Officer is placed at the head of each section of the Staff. The other Officers and the Archivists are distributed by the War Minister on the recommendation of the General Commanding. The orderly Officers form the private Staff of the General Commanding, who employs them as required.

The distribution of Staff duties is as follows:

1st Section (Active): General correspondence, training, and operations, personnel, discipline, and administration.

2nd Section (Territorial): Organization, recruiting, mobilization, local affairs, military establishments, and defences.

The Staffs of Divisions, &c., are arranged on similar principles.

2nd Part.—Services in War.—To the Staffs "with the armies" belong:

The General Staff of the superior headquarters.
The Staffs of the Army commands.
" " Army Corps, divisions, and brigades.
" for special formations (Reserve, siege, and cavalry corps).
" for Étappen and railway services.
" for artillery and engineer commands.
" of the commands in fortified places.

The Staffs "in the interior" consist of:

The Staffs in the regional commands.
" for the depôt commands.
" of the artillery and engineer commands.
" " commands in fortified places (so far as these do not already exist in peace).

In war the duties of the Army Corps are divided into three heads:
1st. The duties connected with the organization, states, appointments, supply, ammunition.
2nd. Intelligence.
3rd. Operations.
The allotment of the Staff to the several formations is the following:—

Army Corps: 2 Colonels or Lieutenant-Colonels.
" 2 to 3 Majors.
" 3 Captains.
" 2 orderly Officers.
Division: 1 Lieutenant-Colonel or Major.
" 1 to 2 Captains.
" 1 orderly Officer.
Brigade: 1 orderly Officer.

To the Staff of each Army Corps are attached two or three Archivists, and to each division or brigade that comprises a territorial command one Archivist. They have the rank and position of Officers, and number in all 183, divided into principal Archivists, and those of the 1st, 2nd, and 3rd class.

Organization.—The infantry was increased by 23 battalions; of these 18 were added to the regional regiments, 3 went to form the new 163rd Regiment, and 2 were added to the foreign regiments. In the reasons set forth in the Bill for forming 4th battalions to the regional regiments, the desirability of having only one sort of infantry regiment is dwelt on.

The new organization of the 18 regiments (Nos. 145 to 162) render that number of battalions available to receive the excess of Reserve men that will be shortly forthcoming under the operation of the 1889

Law. It is further desirable to attach in peace men to the cadres of these 4th battalions, to be taken at first from the total effectives of the infantry. The present number of battalions in the regional regiments is too small to provide sufficiently for service in fortified places; consequently battalions from other regiments have hitherto had to be employed for this purpose. By the changes contemplated the increased cost would be small, for the intention is to decrease at the same time the "cadres complémentaires" of the 144 sub-divisional regiments in non-commissioned officers and men, who would be transferred to the regional regiments.

To form the new 163rd Regiment, which was assigned to the 59th Infantry Brigade (30th Division, 15th Army Corps), with its quarters at Nismes, a company was taken from each of the regiments of the 15th Army Corps, and three companies were taken from the 16th Army Corps.

By the Law of the 21st June, 1890, the article of the 1875 Law was abolished that forbade the assembly together in peace-time for instructional purposes of bodies of troops belonging to the Territorial Army and bodies of the Active Army. The introduction of this change was facilitated by the circumstance that the first two battalions of each territorial regiment are formed from the youngest classes, and include only men who have served a complete three years with the colours. Further, these battalions, together with the 4th battalion of the corresponding Line regiment, consisting in peace only of the "cadre complémentaire," being raised on mobilization to war strength by means of Reserve men, form the "régiments mixtes" with the numbers from 201 to 345; they are, in effect, Reserve infantry regiments. During 1891, of the whole 144 regiments, 72, or one-half, being all those bearing uneven numbers, were called up for exercises of fourteen days' duration. This was the first occasion on which regiments of Reserve had been embodied.

The 1st battalions were formed of Reserve men of the 1883 and 1884 classes, who filled up the "cadre complémentaire" of the corresponding Line regiment; the 2nd and 3rd battalions were formed of men of the Territorial Army of the 1878 and 1879 classes, and furnished with Officers from the Territorial Army. The average strength of companies was 150 men. The battalion Commanders and Captains were provided with horses by the mounted branches. This year (1892) the regiments with even numbers are to be trained and formed into divisions, with cavalry and artillery attached for manœuvres.

Employed Men.—In a circular issued from the War Office last October, stringent directions were given to reduce the number of soldiers in employment by which they are withdrawn from the ranks. Soldiers are no longer to be permitted to give their services to theatres or public displays. Guards are only to be exceptionally provided for civilian and fiscal buildings.

The number of sentry posts and the number of soldiers employed as clerks and orderlies in offices are to be reduced. Permanent orderlies are not to be furnished for offices; but four men may be selected to succeed one another, a different one each day. If a daily

change be impracticable, it must be carried out every fourteen days. The number of acting bandsmen per regiment (3 battalions) is to be reduced to 24, and no soldier is to be employed as such until he has completed his military training.

All detached men, whose employment is not specially provided for, are to be drilled once a week; no man is to be excused musketry.

Cavalry Organization, &c.—During the year three new regiments —the 30th Dragoons, 13th Hussars, and 13th Cuirassiers—were formed. All regiments of the same nature had to contribute to their formation, either in the form of complete squadrons, or of subdivisions of men taken by lot. This increase brought up the number of cavalry regiments to 87, of which 77 are stationed in France, and 10 in Algeria and Tunis. Of the 77 in France, 38 belong to the Army Corps, and 39 to the cavalry divisions.

Those with Army Corps are formed into brigades each of 2 regiments; the cavalry divisions, 6 in number, vary in strength from 3 to 4 brigades, each of 2 regiments. The headquarters of the cavalry divisions are at the places stated below:—

1st	Cavalry	Division	Paris.
2nd	„	„	Lunéville.
3rd	„	„	Châlons-sur-Marne.
4th	„	„	Sedan.
5th	„	„	Melun.
6th	„	„	Lyons.

The Law of the 25th July, 1889, authorized the creation of 13 new cavalry regiments, which were to be gradually raised. Up to the end of 1891, 9 of these had been formed, and the formation of 2 dragoon regiments, 1 cuirassier, and 1 hussar regiment, is to be proceeded with during 1892, and they will, it is assumed, form a 7th Cavalry Division.

As in the infantry, so also in the cavalry "régiments mixtes" (reserve regiments) have been formed. In each corps cavalry regiment, two squadrons (a 6th and 7th) are to be provided for from Reserve men, which will form, together with two squadrons composed of men belonging to the youngest classes of the Territorial Army, a "régiment mixte."

Each of these regiments is permanently attached to an active regiment of the corps cavalry brigade for purposes of administration and mobilization.

The available strength of the arm on mobilization will thus be the following in future:—

Independent cavalry divisions	42 regiments.
Corps cavalry brigades	38 „
Reserve cavalry regiments	38 „
Territorial cavalry	76 squadrons.
„ „	38 Ersatz squadrons.

Artillery.—The following particulars regarding the distribution of

the artillery on the east frontier are taken from statements in French military papers:—

Besides the field artillery of the 6th Army Corps (6th Brigade, with the 8th and 25th Regiments on the higher peace establishment), the following batteries are stationed in the 6th Region:—

8 horse artillery batteries (the 12th Batteries of the 10th, 32nd, 35th, 23rd, 27th, 24th, 34th, and 38th Regiments; of which 3 are attached to the 2nd, 2 to the 3rd, and 3 to the 4th Cavalry Division).
2 Batteries, the 9th of the 6th and 36th Artillery Regiments, which, in conjunction with the 7th and 8th Batteries of the 25th Regiment, form in Demiremont and Brugères, the group of the Vosges batteries.

The 1st, 2nd, and 3rd	Batteries,	15th	Regiment,	in Verdun.
„ 7th, 8th, and 9th	„	38th	„	in Toul.
„ 7th, 8th, and 9th	„	24th	„	in Châlons Camp.
„ 7th, 8th, and 9th	„	35th	„	in St. Michel.

The total number of batteries, therefore, in the 6th Region is 46, of which 11 are horse artillery.

The artillery in the frontier arrondissement of Belfort, belonging to the 7th Region, has been increased by 4 batteries, and since the beginning of March 13 batteries have marched into the frontier districts.

Training.—By an instruction of the 11th February, 1891, the practical training of the artillery is to be extended, so as to include the making of fascines and other revetting materials, the construction of gun emplacements, field service duties in the country, exercises in shooting, loading up railway transport, and the use of explosives.

In the Châlons Camp an exercise, lasting eleven days, took place of the whole of the batteries of the 7th and 19th Artillery Brigades, and of the 2nd and 3rd Cavalry Divisions, in all 52 batteries, representing the artillery of an Army Corps of war strength. Smokeless powder was employed, and the batteries fired massed against indicated objects answering to service conditions; the reconnaissance and occupation of positions, and the supply of ammunition were practically carried out on the ground. To enable the replenishment of ammunition to be practised, three artillery ammunition sections were employed. The exercises were superintended by Lieutenant-General de la Hitte, President of the Artillery Committee. A detailed account of them is to be found in the September number of the "Revue d'Artillerie" for 1891.

Medical Services.—The following has replaced Article 16 of the 1889 Regulations:—

The medical Service embraces the duties in the first line and those in the rear of the army.

To the former belong:

1st. The regimental service, destined to afford the first assistance to the sick or wounded, whether in quarters, on the march, or in action; the regimental Surgeons, with the sick attendants and bearers of the troops at hand provide for this.

2nd. The ambulance service, which, in concert with the regi-

mental service, provides for getting the wounded under cover, and attending on them until they can be handed over to the field hospitals.

3rd. The field hospitals, which come into operation in the vicinity of the battlefield, have to take over the treatment and care of the wounded.

The medical services in rear of the army embrace:

1st. The provisional stationary field hospitals, in which the wounded and sick who cannot bear removal are treated.

2nd. The convalescent depôts, for the reception of those who will be fit for duty again after a few days' rest and treatment.

3rd. The evacuation hospitals, which receive from the field hospitals and ambulances those patients who are capable of transport, in order to transfer them as quickly as possible to the establishments in the interior.

4th. The trains for their transport by rail to the rear, and the railway station hospitals.

Non-commissioned Officers.—The number who re-engage voluntarily on the expiration of their legal term with the colours has been constantly on the increase since the Law of the 18th March, 1889, which offered material advantages at once to the re-engaged non-commissioned officer, besides the prospective advantages of a post in the civil service and pension.

In 1889 the number who re-engaged was 4,118, whereas in 1890 it was 8,126; and on the 1st January, 1891, the entire number serving who had re-engaged was 24,003, distributed as follows:—

Infantry	13,717
Administrative troops	1,919
Cavalry	3,203
Artillery	4,127
Engineers	508
Train	529

In the Budget of 1892 provision has been made for a further total increase of 2,000.

By the Law of 1889 the re-engagement of a non-commissioned officer is cancelled if it should become necessary to inflict on him a punishment in excess of sixty days' imprisonment. But in order also to dispose of any non-commissioned officer who by reason of his misconduct may be thought to be unworthy of retaining his position, Courts of Enquiry, in a certain sense Courts of Honour, were introduced last year. In an infantry regiment, for example, they are to be composed of the Colonel, 2 Battalion Commanders, 4 Captains, and 2 non-commissioned officers. The arraignment of a non-commissioned officer before such a Court is ordered by the General Commanding the corps or the Military Governor, when the former has conducted himself in a manner unsuitable to his rank, has been guilty of gross negligence in the performance of his duties or of an infraction of discipline, which are punishable by more than three months or by reduction, or of violating their parole. The proceed-

ings are verbal, but secret. The Court have to give their opinion whether the individual concerned appears unworthy to continue a non-commissioned officer, and if he should be dismissed or reduced. The confirmation is reserved for the General Commanding or the Military Governor, as the case may be. The military press reports favourably on this new procedure.

A Ministerial instruction regulates the appointment to the civil service of entitled non-commissioned officers, who must be of exemplary character and under 40 years of age. The appointments are classified in four categories, according to the degree of knowledge and general instruction possessed by candidates. For appointment to one of the first three categories, it is necessary to pass an examination, on the results of which the classification is based.

Units of the Active Army.—On the 31st December, 1891, the French Active Army consisted of:—

584 battalions.
435 squadrons.
480 field batteries.
100 fortress batteries.
116 companies of technical troops.
75 train companies.

The troops assembled in the 6th Region amounted to 89 infantry battalions, 100 squadrons, and 46 batteries, 11 of which are horse artillery.

The formation of a 20th Army Corps in this frontier region, which has been spoken of by the press for two years past, was not carried out in 1891; but it was considered imminent.

Territorial Army.—Not much progress appears to have been made in the constitution of Territorial rifle battalions, though a beginning has been made in the 14th and 15th Army Corps districts. It has now been settled as a permanent arrangement that the men belonging to the Territorial Army of the classes liable to training shall be called up in alternate years, those belonging to regiments bearing even numbers in the even years, those belonging to regiments of uneven numbers in the odd years.

The Budget for 1892 provides for the means of training the following numbers of the Territorial Army, the Officers for a period of fifteen days, the men for thirteen days.

Infantry	6,922	Officers,	110,522	men.
Administration troops ..	—		6,631	„
Cavalry	648	„	6,995	„
Artillery	1,040	„	2,778	„
Engineers	212	„	3,806	„
Train	271	„	8,608	„

Besides these numbers, 12 superior Officers, destined to be Governors of fortified places in war, 45 cavalry Officers, and 600 Sub-Lieutenants of artillery and 35 of the engineers were called up for

special courses. The training of the battalions formed is stated to have been carried out under difficulties which made it hopeless to expect satisfactory results. Amongst these difficulties have been indicated the weakness of the battalions, the fact that Territorial lists of the other arms are included amongst them, the insufficient training of the instructors, and the shortness of the period during which they were up.

The composition of the Territorial Army on the 1st November, 1891, was the following:—

145 infantry regiments of 5 or more battalions, of which the first two belong to the "régiments mixtes."
10 battalions of Zouaves.
150 squadrons, of which 72 belong to the "régiments mixtes."
18 artillery regiments and 13 foot batteries (Algeria).
18 engineer battalions.
18 train squadrons.

Greece.

Organization.—The scheme introduced in 1887 is still in force; but a Committee has been sitting to consider the subject of reorganization in the Army. Under existing arrangements it consists of:—

Infantry	10 regiments, of 3 battalions, of 4 companies.
Rifles	7 battalions, of 4 companies.
Cavalry	3 regiments, of 4 squadrons.
Artillery	3 field artillery regiments.
Engineers ..	1 regiment, of 2 battalions, of 4 companies.
Train	1 company.

The nominal peace strength of an infantry battalion is 406 men, exclusive of Officers; that of a rifle battalion 443, including Officers. On mobilization the strength of the company is raised to 250, and there is power in that event to form 15 new battalions, which would bring the entire strength of the infantry to 53 battalions—in round numbers, 53,000 men. The prescribed strength in peace of a squadron is 128 men and 100 horses; but the effective in both is much less. On mobilization the squadron is raised to a strength of 175 men and 150 horses, and 1 new squadron per regiment is formed, The whole strength of the cavalry, therefore, would be 15 squadrons. or about 2,250 sabres. In the artillery the 1st and 2nd regiments have each 4 field and 3 mountain batteries; the 3rd regiment is composed of 2 field, 1 mortar, and 3 mountain batteries. The peace strength of a field battery is 132 men, 64 horses, 6 guns (Krupp's 8·7-cm.), and 6 ammunition wagons. That of a mountain battery is 122 men, 18 horses, 30 mules, 6 guns (Krupp's 7·5-cm.), and 7 two-wheeled ammunition wagons. In the event of war the deficiencies in the regulated establishments would be completed and further batteries formed. Men, guns, and equipment are available for 10 batteries, but great difficulty would be experienced in obtaining the required teams.

The nominal peace strength of an engineer company is 119 men, to be raised to 250 in war.

No arrangements have been made to provide the increased number of Officers that would be required in war.

The gendarmerie consists of 15 Officers, 3,376 men foot, and 256 men mounted.

The recruiting contingent varies from 10,000 to 11,000 men.

The regulated peace strength for the several arms is the following:—

Infantry	16,361	men.
Cavalry	1,608	„
Artillery	3,382	„
Technical troops	1,040	„
Gendarmerie	3,743	„
Total	26,134	„

As a fact, in consequence of the numerous furloughs and desertions, the effective strength has not, for years, exceeded 18,000 or 20,000 men. On the 1st October, 1891, it was 19,952, including Officers. On paper there are 150,747 men belonging to the Reserve; but on the occasion of the last mobilization, in 1885, after eight yearly classes had been called up, only 30,000 men rejoined, instead of 60,000, as was expected.

It may be taken, however, that within six weeks the Greek mobilized army would number 85,000 men, and it might, in favourable conditions, with money and time available, be raised to 120,000, which is the maximum attainable strength. The quality of the army leaves much more to be desired than its quantity. Apart from the shortcomings in the matter of the special administrative services, which would, on mobilization, seriously affect efficiency, there are other causes at work, political for the most part, which prevent any solid progress being made in the improvement of the army and its training.

The actual value of an army can only be found by a comparison being made between it and its natural and probable opponents. The natural opponents of Greece are Turkey and Bulgaria. But if one compares, critically and without bias, the Greek Army with the armies of the two States named, it will be found not to equal them either in numbers, organization, or training.

Austria-Hungary.

During 1891 the completion of the organization which had been actively carried on during the two preceding years was continued extensively. The reorganization of the field artillery, accompanied by an increase of both the peace and war effectives, the new distribution of the train troops in connection with the new regulations for supply in war, the creation of a 96th Infantry Brigade command at Zara, the institution of fortress artillery inspections at Vienna and Buda-Pesth, and

the separation of the functions of the Inspector-General of Remounts from those of the military Inspector of the Horse-breeding Establishments were the more notable changes in matters connected with organization. As regards regulations, there are to be noticed the musketry instruction for the cavalry armed with the magazine rifle, a revised edition of the first part of the artillery drill, and new instructions for fortress artillery practice :—

Strength: Peace—

Army service.....	16,993	Officers,	259,874 men.
Austrian Landwehr	1,573	„	9,514 „
Hungarian „	1,993	„	16,204 „
Bosnia-Herzegovina	176	„	2,860 „
Together	20,735	„	288,452 „

War—

Unattached.....	7,980	Officers.	
Army, including Reserve..	23,031	„	939,884 men.
Austrian Landwehr	3,190	„	192,800 „
Hungarian „	3,408	„	234,554 „
Bosnia-Herzegovina.....	—	„	18,400 „
Together	37,609	„	1,385,638 „

Magazine Carbine.—The whole of the cavalry regiments of the Army and both Landwehrs are armed with the small-bore magazine carbine, firing exclusively cartridges with smokeless powder.

Machine Guns.—The Maxim 8-mm. has been introduced and exhaustive instructions regarding it have been issued. They are to be employed only in fortress warfare on the defensive, for strengthening points where a heavy infantry fire is desirable, but cannot be secured from the absence of infantry positions, and also, though only exceptionally, in support of infantry fire.

The machine gun therefore serves :—

1st, like infantry fire, to sweep from the walls the nearer, and in certain cases the more distant, ground outside;

2nd, to increase the power of resistance against assault of defensive works constructed only during a war;

3rd, for employment in positions between forts to increase their security;

4th, to sweep communications, flank entrances, and defend sections;

5th, for mobile employment, requiring only to be sent to a place and brought into action when really required. For instance, to strengthen the fire power of certain localities or of the infantry fire in positions in the ground lying immediately in front and in intermediate positions;

6th, to sweep the ditch and flank the gorge of permanent or provisional works against assault.

Supply in War, and the Reorganization of the Train.—The division of the latter into three regiments, with their headquarters at Vienna, Buda-Pesth, and Prague, remains unaltered. Each regiment has

4 to 5 train divisions of 5 to 7 train squadrons. The peace strength consists of 14 train divisions, 80 train squadrons, 15 Ersatz depôt cadres for train divisions, 3 Ersatz depôt cadres for regiments. Together these amount to 322 Officers, 2,800 men, 1,501 horses, and 36 pack animals. Besides these formations there are two special train sections in Bosnia and Herzegovina, as well as train matériel depôts at Klosterneuberg, Buda-Pesth, and Sarajevo.

In war a train squadron is allotted to the superior headquarters and to each Army Corps and division command. The train squadron for headquarters consists of 2 subdivisions, of which the 1st is attached to the operating headquarters, and the 2nd to the General Etappen command. The train squadrons with army commands have 4 subdivisions, of which the 3rd and 4th form the supply train. The train squadrons with Army Corps commands have each 6 subdivisions; of these the 3rd and the 6th form the supply train, the 6th carrying exclusively preserved provisions.

Equally the train squadron of an infantry division consists of 6 subdivisions. The squadron command is at the same time the train command of the division. The 1st subdivision (1 Subaltern Officer, 102 men, 166 horses) horses the wagons of the division and brigade staffs, of the divisional sanitary establishments, of the sanitary column of the German "Ritter" order, of the field post, the staff troops, and the Generals. Attached are 3 civilian vehicles for the personal effects of Chaplains, Auditors, and officials; also when the roads are bad 21 requisitioned spare wagons.

The 2nd, 3rd, 4th, and 5th subdivisions (each 1 Subaltern Officer, 12 men, 8 horses), with 82 civilian vehicles per subdivision, carry each a relay of the infantry supply column; each of these relays carries a one day's supply for 17,700 men, 22,000 draught and 1,300 civil horses. The 6th subdivision (1 Subaltern, 34 men, 16 horses) carries on 152 civil wagons three days' supply of preserved provisions for the foregoing numbers of men and horses. This reserve relay is in three parts, each one of which carries the supply for one day.

The train for a cavalry division is formed and subdivided on similar principles, with certain differences in detail.

The field supply magazines number 14, each of which is divided into 15 relays, 5 for each of the 3 infantry divisions of the corps. The first 4 relays carry each one day's supply, the 5th three days' supply of reserve or preserved provisions. One of the relays carries besides the one day's supply and the three days' reserve provisions for the corps, Army, or superior headquarters, and for the troops of the command concerned not comprised in the divisions.

Consequently the troops have with them, exclusive of what they carry on their persons or their horses, and in their immediate provision trains, provisions for 14 days, of which 6 are preserved. By this means provisions are guaranteed for from 19 to 20 days.

Each field supply magazine is accompanied by a train escort squadron consisting of a squadron staff (Captain, Veterinary Surgeon, 9 men, 11 horses) and 15 subdivisions. The 15th has 1 Subaltern, 49 men, 22 horses, and 215 civil wagons; the 13th and 14th have

each 1 Subaltern, 30 men, 16 horses, and 152 civil wagons; the 3rd, 6th, 9th, and 12th subdivisions are composed in the same manner, only that they have 28 wagons less; all the other subdivisions are of similar strength to the subdivisions Nos. 2 to 5 referred to above.

The new organization of the supply establishments is in close relation to that of the train. By means of changes in their subdivision and constitution they have been given increased mobility, while at the same time the troops have been afforded greater independence in respect of their supply.

The supply establishments consists of military supply magazines and branch magazines in peace-time, to which are added in war the mobile and stationary field supply establishments.

The mobile establishments comprise (i) the infantry supply columns, (ii) the cavalry supply columns, (iii) the corps supply columns, (iv) the supply trains of the Army commands and of the Commander-in-Chief, and the field supply magazine, (vi) the field bakery, (vii) the cattle depôt, (viii) the Etappen supply train.

To the stationary field supply establishments belong: 1st, the reserve supply magazine; 2nd, the reserve bakeries; 3rd, the reserve cattle depôt.

The advantages which the new supply columns offer, as compared with the former ones, are obvious. Instead of carrying supplies for four days they provide for seven days' maintenance, and by this means the independence of the divisions in regard to their supply is materially increased and operations facilitated. On the other hand, the new supply columns, owing to their subdivision into relays, each containing one day's supplies, are less ponderous, and possessed of increased mobility.

Reorganization of the Field Artillery.—The number of guns is 1,912, exclusive of the reserve guns attached to the Reserves, the sortie batteries, and the machine guns belonging to fortified places. Each of the 14 corps artillery regiments is composed both in peace and war of 2 battery divisions, each of 3 batteries of 8 guns (9-cm.); together, 672 guns. Each of the 42 independent battery divisions attached to the infantry divisions consists of 3 batteries of 8 (in peace only 4, except in Galicia and Bukowina) guns; making 1,008 guns. Each of the 8 horse artillery battery divisions attached to cavalry divisions is composed both in peace and war of 2 horse batteries of 6 guns; together, 96 guns. In peace there is one mountain battery of 4 guns with each of 12 corps artillery regiments; in the event of mobilization a second battery of a similar nature is added to each, so that the organization provides for 96 guns of mountain artillery in war. Lastly there is in the Tyrol an independent mountain battery division, consisting in peace of 3 batteries of 4 guns and in war of 6 batteries, also 4 narrow-track field batteries of 4 guns; together, 40 guns. As in peace there are only 4 cavalry divisions (in Cracow, Vienna, Lemberg, and Jaroslau), and the others are formed only in brigades, the horse artillery batteries are in peace attached to 8 of the corps artillery regiments.

The reorganization secured also for the artillery a uniform calibre.

The field, horse, and narrow-track batteries have throughout 9-cm. guns. The mountain batteries alone, the guns of which have to be capable of transport by pack animals, are of 7-cm. calibre. Temporarily the horse batteries have still their former guns (8-cm.), but they are to be replaced by the 9-cm. gun in the course of 1892.

A further advantage has been secured, by the abolition of the reduced establishment on which certain of the batteries used to be kept. The independent battery divisions No. 29 to No. 42 are destined for 14 divisions of Landwehr which would on mobilization be incorporated in the field army. As these Landwehr (or Honvéd) divisions would, on account of their reduced peace strength, not have completed their mobilization until some days later than the divisions of the Regular Army, it used to be thought sufficient to keep the batteries that would accompany them on a reduced strength of only 2 guns. This unsatisfactory arrangement has now been abolished, to the advantage of good training and efficiency on mobilization.

It is also of importance that the distinction between the artillery Reserve establishments of the 1st and 2nd line has been done away with. The completion of ammunition is effected simply from the nearest ammunition park. The arrangement by which mountain ammunition field depôts are to be established for troops operating in mountainous districts is also new. The amount of ammunition to be carried by the artillery reserve establishments has been materially increased. The divisional ammunition park carries 110 rounds per gun, and 57 rounds per rifle. The corps ammunition park has 110 rounds per gun of the corps artillery, and 27 for each rifle of the troops belonging to the Army Corps. The Army ammunition park contains 36 rounds per gun and 26 rounds per rifle or carbine of the Army.

The divisional ammunition park comprises one infantry and one artillery ammunition column. The corps ammunition park consists of one infantry and two artillery ammunition columns. An attempt has been made to keep down as much as possible the number of wagons, notwithstanding the increase effected in the quantity of ammunition carried. Thus, for example, the corps ammunition park and the cavalry division park together consist of 232 vehicles, 12 wagons less than under the previous organization. This has been made possible by the introduction of a new pattern of ammunition wagon.

The following is the composition of each corps artillery regiment in peace: (i) the regimental staff; (ii) the 1st and 2nd battery division, each of 3 batteries, with the numbers 1 to 3 and 4 to 6; (iii) the cadre of the ammunition park; (iv) the Ersatz depôt cadre; there are further in immediate connection with these regiments: (v) to each of the corps artillery regiments Nos. 1, 2, 4, 5, 6, 7, 10, and 11 is attached a horse artillery battery division with the number of the corps artillery regiment to which it is attached. Each consists of a battery division staff and 2 horse batteries numbered 1 and 2; (vi) to each of the regiments Nos. 1 to 3 and 6 to 14 is attached a mountain battery numbered 1.

Each of the 42 independent battery divisions is divided into: i, the Staff; ii, 3 batteries, numbered 1 to 3; iii, the ammunition park and Ersatz depôt cadres, from which, on mobilization, the divisional ammunition park, consisting of an infantry and an artillery ammunition column and the Ersatz depôt, are formed. The divisional ammunition parks bear the numbers coinciding with that of the battery division from which they are formed, viz., from 1 to 42. With an army in the field the 1st and 2nd battery divisions of the corps artillery regiments are designated the corps artillery; the battery divisions 1 to 42 as the divisional artillery of the infantry and Landwehr divisions; the 8 horse artillery batteries as the divisional artillery of the cavalry divisions.

The corps and divisional ammunition parks would be attached to the same troops as the batteries of the formations from which they are derived. The cavalry divisional ammunition columns are generally attached to the cavalry division having the same number as the horse artillery battery division to which they belong.

The independent mountain battery division in the Tyrol is constituted as follows: i, the divisional Staff; ii, 3 mountain batteries with mixed mountain equipment, numbered 1, 3, and 5. On mobilization they are doubled, and batteries numbered 2, 4, and 6 are formed, the Ersatz depôt cadre, from which is formed on mobilization the Ersatz depôt for the division, and from it 4 narrow-track field batteries.

In each Army Corps, with the exception of the 15th (Bosnia-Herzegovina), the corps artillery regiment and the independent battery divisions allotted to divisions of infantry and Landwehr belonging to the Army Corps are formed into an artillery brigade that bears the number of the Army Corps concerned. In peace each artillery brigade is quartered in the territorial area occupied by the corps.

The artillery reserve establishments of an army in the field consist of, 1st, the mobile establishments, viz., (i) the mountain division ammunition parks, (ii) the divisional ammunition parks, (iii) the corps ammunition parks; and 2nd, (iv) the army ammunition field depôts and (v) the mountain ammunition field depôts.

Each army ammunition park is divided as follows: 1st, the Staff; 2nd, reserve ammunition columns, equal in number to the Army Corps; 3rd, a reserve column of implements required for the manipulation of the ammunition and stores of matériel in the park.

The completion of the ammunition expended by the troops will, as a rule, be effected by the company ammunition wagons of the infantry and rifles or by the battery wagons of the artillery, as the case may be, directly from the divisional (corps) ammunition parks, in such a manner that it shall generally be obtained from the ammunition establishments of the Army Corps to which the troops requiring the ammunition belong. But if troops find themselves in the vicinity of ammunition columns not belonging to their particular Army Corps, they may, if they require it, indent on them for ammunition.

The divisional (corps) ammunition parks draw the necessary supplies to complete from the army park, and also eventually direct

from the army ammunition field depôt. The army park fills up also from this source. These latter consignments are forwarded by rail, ship, or hired transport, formed in convoys of from 35 to 40 wagons.

Generals or Staff Officers of artillery will be attached to the higher commands and Staffs of an Army in the field to assist with their advice in regard to artillery matters. They are: i, for the Army command, the Chief of Artillery for the Army; ii, for the Army Corps commands, the artillery Brigadiers; iii, for the divisional commands and divisions forming a part of the Army or Army Corps, the Commandants of artillery battery divisions; iv, for the general Etappen command of the Commander-in-Chief, an artillery Officer attached for the purpose.

Landsturm.—The organization of the Landsturm, introduced both in Austria and Hungary a few years ago, has been materially strengthened since, especially in Hungary, where the formation of Landsturm regiments of 3 to 4 battalions, and of Landsturm hussar squadrons in each of the 7 Honvéd districts, has been actually carried into effect. From the younger classes of Landsturm men, viz., those between 33 and 36 years of age, who have served in the Army or the Honvéd, 8 infantry brigades (60 battalions) and 10 squadrons have been organized. Their strength would be 1,000 men per battalion, and 150 sabres per squadron; and not only has the necessary provision of arms, clothing, and equipment stores been made, but they are provided with Officers and Staffs, so that on the fifth day from the men being called up and the horses collected they will be ready to march. The remaining 124 Hungarian Landsturm battalions and 15 squadrons have indeed the full war strength of non-commissioned officers and men, while a sufficient quantity of stores are ready for them in the magazine; but the establishment of Officers is as yet very incomplete. In the case of the Austrian Landsturm battalions there is no deficiency in this respect; the war establishment of Officers is complete in the 92 field battalions, and there is only a small deficiency in the 92 territorial battalions.

As regards the men, the number borne on the rolls is so great that the combination of the supplementary company to be formed by each Landsturm battalion with two or three such other companies would make it possible to form 50 or 60 more battalions.

Cavalry Carbine Instruction.—The issue of the small-bore repeating carbine to the cavalry has necessitated a new edition of the instructions regarding musketry training in that arm. With the normal position of the sight (500 paces) the limit of short range is 600 and of medium range 1,200 paces; the greatest range provided for by the sight is 2,400 paces, and the extreme range 5,500 paces. The lowest sight, 300 paces, is only to be used when shooting at single soldiers; otherwise the normal position (fixed sight) is to be employed at distances up to 600 paces. Judging distance up to this distance at intervals of 100 paces is to be practised by all soldiers. Soldiers who show special aptitude for judging distances correctly are to be trained as thoroughly as possible. The 1st (lowest) class fires, as a preliminary,

5 rounds at 200 and 5 at 300 paces (4 or 8 in the infantry) standing and kneeling, at an ordinary target, followed by 5 series of 5 rounds at half and entire figures; the last two series are at 500 and 600 paces at 2 or 3 figures placed close together. Soldiers who, in these 5 series, make 40 per cent. hits pass into the 2nd class; those who fail remain in the 1st class, and fire in it again the following year. The 2nd class fires 10 rounds as preliminary practice at the ordinary target, followed by 5 series of 5 rounds at third and half figures, entirely disappearing, and 2 figures placed close together. Those who in the regular practice make 50 per cent. hits are nominated marksmen. They form the 3rd class, and shoot the same preliminary practice as the 2nd class, and afterwards fire at moving, half and entirely disappearing figures and at 2 disappearing figures placed close together.

In long-range firing 3 distances over 1,000 paces, 1 between 1,800 and 2,400 (in the infantry 2,500) paces are to be selected. The simultaneous employment of two different sights (mixed sights) is to be adopted when the estimated distance lies between two distances as marked on the sight, or when the object is moving from or approaching towards the firer; also at a stationary object when required to neutralize the uncertainty of the distance estimated, wind, temperature, &c. The preliminary practice is restricted to ranges up to 400 yards.

Roumania.

The year 1891 was an important one by reason of: i, the decision regarding the supply of armoured towers and guns for the fortifications of Bucharest; ii, the adoption of the Mannlicher rifle; iii, the reorganization of the infantry.

The system on which the defensive works about Bucharest should be erected was decided as long ago as 1885, and consisted mainly in the construction of 36 forts on a circumference distant from 7 to 9 km. from the *enceinte* of the city. The first of the forts constructed were made with deep ditches and masonry scarps and counterscarps, in accordance with the accepted principles of the day; each were to hold 2 companies, or about 500 infantry men, and to mount from 20 to 30 guns, mostly situated behind breastworks and exposed. Fortunately only 4 out of the 36 projected forts had been commenced when, in 1886, the French experiments with high explosives against Fort Malmaison at La Fère proved, without any doubt, that other principles must be adopted. The Roumanian Government recognized that armoured towers must be made use of to protect the guns, and exhaustive trials were entered on with a view to deciding the best type of tower. The results of these trials were in favour of a pattern which was last year finally adopted, and the following orders were placed, all with French firms:

34 armoured towers, each for 2 15-cm. guns.
18 „ „ for 1 15-cm. gun.
26 „ „ for 1 21-cm. howitzer.

126 sunken armed towers for 1 5·7 quick-firing gun.
392 caponier carriages for quick-firing 5·7-cm. guns.

There still remain to be ordered:—

38 towers for 1 21-cm. howitzer.
6 „ „ 15-cm. gun.
54 armoured look-out stations.
400 quick-firing 5·7 guns.
Ammunition.

The following was reported in the press to be the state of the earthworks themselves:—Forts Kitila (on the Verchowa-Jassy road) and Giliva (on the Giurgevo road) were finished in the spring of 1891; six others would, it was estimated, be completed in the spring, and a like number in the autumn, of 1892. But the execution of the orders given for the matériel cannot be completed within less than five to six years, until which time the further orders to complete this matériel are not to be placed. It appears, therefore, to be probable that the 19th century will have come to an end before the entrenched camp of Bucharest will be finished and the works completely armed.

Reorganization of the Infantry.—Hitherto the infantry consisted—exclusive of 6 rifle battalions that are not affected by the new arrangements—of 8 Line and 33 Dorobanz regiments, all of 2 battalions. Each of the 4 Army Corps was therefore composed of 2 Line and 8 Dorobanz regiments (the 33rd Dorobanz Regiment, lately formed in the Dobrudscha, was extra) in 5 brigades, therefore, including the rifles, 21 or 22 battalions. The line regiments had a permanent establishment, they were recruited from the whole Army Corps territory, and were stationed in the principal towns. The men served 3 years with the colours, and then passed to the Reserve for the remainder of their 9 years' service. The Dorobanz regiments had only two permanent companies each, whilst the remaining companies were only embodied during short periods for training and exercise. Their period of service with the colours was for 5 years, so they belonged to the Reserve for 4 years.

Under the new organization, the line regiments have been done away with and distributed by battalions, as 3rd battalions with a permanent establishment, which included the previously existing two companies, to the Dorobanz regiments. For the purpose there were available the previously existing 8 line regiments = 64 companies, and the 2 permanent companies of the 32 Dorobanz regiments = 64 companies, together 128 companies = 32 battalions. The 33rd Regiment in the Dobrudscha forms its own Line battalion, which its extensive recruiting area enables it to do unassisted.

In each of the 33 territorial districts a number of recruits are called up for 3 years' service with the permanent battalion; the remainder are called up to the other two battalions with variable establishment, of which usually only the cadres exist, and come up only for periodical training. From them, however, are drawn any

men required in the course of the year to supply the place of the casualties that occur.

The men of the permanent battalions after serving 3 years are dismissed on permanent furlough for 4 years, during which time, unless in the event of a mobilization, they are called up only for the great manœuvres. The men of the battalions with variable establishment serve 5 years under the conditions specified above, and then are on furlough for 2 years. The whole of the men, therefore, during the last 2 years of their service belong to the Reserve, and are relieved of liability to come up for any training.

The entire requirements for the mobilization of the troops of the first line are satisfied by the seven youngest classes, viz., the men with the colours and those on furlough. The two classes forming the Reserve remain available for new formations for Ersatz and garrison purposes. To this end a depôt cadre is formed in each regiment with which to raise a 4th battalion, to be commanded by a Reserve Officer.

In connection with the reorganization of the infantry, the composition of an Army Corps was fixed as follows:—

2 infantry divisions, each of 2 brigades.
1 or 2 rifle battalions.
1 Kalarasch brigade of 3 regiments (Militia cavalry, 4, 5, or 6 squadrons per regiment, of which one is permanently formed).
1 regiment of Roschori (regular cavalry).
1 artillery brigade.
1 engineer battalion.
1 train squadron.

Russia.

Organization: Infantry.—Although the number of Army Corps has remained the same as in 1890, viz., 17—exclusive of the Guard, Grenadier, and Caucasian Corps—still, preparations have been begun for increasing it and organizing all the Army Corps (except the Guard and the Grenadier Corps) in 2 infantry divisions only. The whole number of these divisions belonging to the field Army is still 41, exclusive of the 3rd Guard and the 5th Grenadier Divisions. Of these infantry divisions the 1st Army Corps alone has now 4; all the others have already only 2. The 24th Division, which has hitherto been quartered in Finland, has been withdrawn without relief, and it seems possible that a new 18th Army Corps may be formed from this and the 3rd Division, hitherto belonging to the 1st Army Corps. This would dispose of 36 (or 37) of the infantry divisions, and leave 4 still available. Of these 2, the 20th and 21st are in the Northern Caucasus, the 40th is in the military district of Kasan, and the 38th, hitherto at Kutais, is now provisionally at Kief. The 40th Division in Kasan will be retained there, presumably as an independent field division, and the 24th Division will have to be replaced by another. But it is possible that, if wanted, the 20th and 21st Divisions might

be moved west, and, with the addition of the 38th Division, form a 19th or 20th Army Corps.

A similar increase might be effected in the number of Army Corps without the assistance of these field divisions by means of the reserve cadre troops, regarding the utilization of which an important step was taken last year. In February, 1891, a new infantry regiment, Kowell, No. 165, of 4 battalions, was formed from the 40th Reserve Regiment, of 2 battalions, and attached to the 11th Division, which now alone has 5 regiments. It was thought that this would be followed by the conversion of other Reserve regiments into infantry field regiments; but this has not been the case, probably from motives of economy. But in April, 1891, 20 Reserve battalions (these battalions are distinguished now by their names; they no longer have numbers) were increased to 6 companies. Almost simultaneously 12 Reserve regiments of 2 battalions were formed from the existing Reserve battalions, and were numbered from 166 to 177 (they also bear territorial titles, thus: 172nd Reserve Infantry Regiment: Pultusk), thus following immediately after the last numbered Line regiment. The regiments thus constituted were further formed into 3 Reserve infantry brigades, numbered similarly from the last of the Line brigades. Thus, besides the 41 field divisions, there are now 42nd, 43rd, and 44th Reserve Infantry Brigades. The establishment of a Reserve regiment of 2 battalions is 40 Officers, 3 officials, and 1,555 men; therefore, in men almost that of a German infantry regiment, and only 340 men less than the Russian infantry regiments of 4 battalions. The organization of the Reserve troops (including natives) in the Caucasus has now been generally carried out, and it was owing to this having been done that it became possible to withdraw the 38th Infantry Division. No such extension can be given at present to the Asiatic Reserve troops, as the men for the purpose are not forthcoming.

Cavalry.—Hitherto there were in Russia, exclusive of the Guard and the Army of the Caucasus, 14 Army cavalry divisions, of which the first 3 regiments consisted of dragoons, and the 4th of Cossacks. Besides these, in European Russia there were permanently embodied 1 Don Cossack division and 1 combined Cossack division, the latter located on the west frontier, and both regarded as Regular troops. The number of Army Corps, including the Guard and the Grenadiers, is 19. There is not, therefore, a cavalry division for each Army Corps, even supposing the Guard to give up one of its Cavalry divisions for Army purposes. In 1891, therefore, a new 15th cavalry Division was formed, to consist provisionally of the 47th and 48th Dragoon Regiments (formed from squadrons transferred from other regiments) and the 3rd Ural Cossack Regiment. This newly formed cavalry division has been allotted to the 15th Army Corps, in place of the 13th Cavalry Division, which has been placed directly under the Commander of the Warsaw military district.

The only Army Corps still left without cavalry are the 1st (Petersburg), for the 1st Cavalry Division is allotted to the Grenadier Corps; the 13th (Moscow); the 16th (Witebsk); the 17th (Nijni

Novgorod), but for this there is an extra Cossack division in the Kief district. In the event of war, arrangements would no doubt be made to attach portions of cavalry to the Army Corps and divisions as divisional cavalry.

One other point to be noticed is the abolition of the post of Inspector-General of Cavalry (also of Engineers), and the staff belonging to it. On the decease of the late Inspector-General, his functions were taken over by the War Office, where a special Committee for cavalry was instituted. The actual inspection of the arm is now carried out by Officers nominated for the purpose.

Artillery.—The number of field artillery batteries has not been increased, but a large number of those located on the west frontier have been increased from 4 to 8 horsed-guns. In the reserve artillery, however, there have been some new formations. Since July, 1891, a 7th battery has been formed in the 4th and 5th Reserve Artillery Brigades. During 1892 the 3rd Reserve Brigade is equally to form a 7th battery in peace with two horsed-guns. The 5th and 6th Batteries of the 2nd Reserve Brigade have been given an increased establishment.

As regards garrison artillery, the former 3 battalions forming the 12 companies of the Kars-Alexandropol Garrison Artillery have been converted into the Kars Garrison Artillery, consisting of 3 battalions, containing 12 companies, and the Alexandropol Garrison Artillery, composed of 3 companies. The 3 mountain batteries stationed at Kief have been formed into a separate regiment with a park. A new garrison artillery battalion of 4 companies has been formed for Zegrsze.

It is to be observed that the tendency in Russia is more and more in favour of giving up the distinction between heavy (position) and light batteries, and only to keep the latter, which have a sufficient power, greater mobility, and can carry more ammunition, and to introduce more mortar regiments, of which there are already three.

Engineers.—From the 1st January, 1892, only the sapper battalions belonging to the 1st, 3rd, 5th, and Caucasus Sapper Brigades are to consist of 5 companies; all the other 6 battalions are to consist of 4 companies each. The previously existing 5th companies of these battalions have been formed into fortress engineer companies for Dünaburg, Kovno, Ossovjez, Novogeorjevsk, Warsaw, and Ivangorod. From the 1st Sapper Brigade have been newly formed a fortress company for Cronstadt and a fortress command cadre at Viborg; from the 3rd Sapper Brigade a company for Brest-Litevsk and a cadre for Dubno; from the 5th Brigade a company for Sevastopol; and from the Caucasus Brigade cadres for Kertch and Otschakov.

The following, therefore, is now the state of engineer formations in Russia:—17 sapper battalions of 5 or 4 companies; 8 pontoon battalions of 2 companies; 1 Turkestan sapper half-battalion; 3 sapper companies for East and West Siberia and Transcaspia; 9 fortress companies, and 4 cadres and 1 technical company.

On mobilization, each battalion that has a 5th company forms with

it 2 reserve companies, except the 1st and 13th battalions, which form 1 reserve and 1 fortress company. By this means, 20 reserve and 2 new fortress companies (for Sveaborg and Bender) are obtained. The fortress companies that exist during peace are expanded in war into 2 companies, and the existing cadres form half companies.

With a view to the formation of bodies of Ersatz troops, the 1st, 2nd, 3rd, and 5th Sapper Brigades detach, on mobilization, Officers and men sufficient to form cadres for 4 Ersatz battalions, each of 4 companies. These battalions have two different establishments, a permanent and a variable one. The reserve sapper companies are in war employed either with the reserve infantry divisions or in connection with the siege of fortresses in rear of the Army. The Ersatz battalions send drafts to replace casualties in the front. The fortress companies provide for engineer services in the fortified places.

Reserve Officers.—Since 1886 the lowest grade included amongst the corps of Officers with the active Army has been Sub-Lieutenant (in the cavalry, Cornet). Previous to that year there was a lower grade, corresponding to the German "Fähnrich," or Ensign. This class has, since 1886, existed only in the Reserve, and is composed of those who, having served with the active Army as one- or two-year volunteers, have, on their transfer to the Reserve, passed a simple qualifying examination. But owing to the progress made with the Reserve formations it was found that the Officers drawn from all sources, including these Ensigns, were, for the infantry, quite insufficient. To meet this difficulty, a still lower grade of Officer has been created, for war only, who occupy the position of cadets ("sa urjad praportschik," literally "provisional Ensign"). They are selected from non-commissioned officers with special qualifications.

Switzerland.

Organization.—After some opposition, a scheme was last year adopted for the amalgamation of the then existing 8 independent divisions into Army Corps. It provided for 4 Army Corps, each of which was to consist of the following:—

2 infantry divisions.
1 cavalry brigade.
Corps artillery.
Corps park.
Bridge train.
Telegraph company.
Administrative services.

Artillery.—In 1890 the creation of fortress artillery was decided on. No such formation existed previously, but the necessity for it arose when the new fortifications were constructed on the St. Gothard. The formation, therefore, of 4 companies was undertaken, to be distributed as follows:—

1 company for Airolo (Fondo del Bosco).
2 companies for Andermatt (Bühl and Bäzberg).
1 company for Oberalp-Furka-Gotthard.

The strength of a company was fixed at 200 to 250 men, including 10 to 12 Officers.

Magazine Rifle.—The 1889 pattern has been adopted, but its manufacture is very slow. The whole of the Field Army will not be armed with it until towards the end of next year. The arm is very well reported on, and it promises to take a high position amongst the small-bore magazine rifles adopted by other States. A practised man can fire with it, in one minute, 12 aimed shots, if used as a single loader, 20 by the aid of the magazine, and 30 in rapid firing (by mechanical contrivance). The rifle can be reloaded without bringing it down. The magazine, situated under the lock, contains 12 cartridges, and can be very easily replaced.

Rifle Practice.—Great facilities and encouragement are afforded in Switzerland by the voluntary shooting clubs. They increase every year, and in 1889 numbered 2,919, with 134,767 members.

Strength of the Armed Forces, 1st January, 1891.—

127,000	men in the	Field Army (age 20 to 32 years).
80.272	„	Landwehr (age 33 to 44 years).
272,124	„	Landsturm (age 17 to 20 years, 45 to 50 years, Officers to 55), of whom 82,436 are armed.

The Landwehr take some part in the annual training and manœuvres, but in time of peace the men belonging to the Landsturm receive no instruction, excepting that in some cantons arrangements have been made for them to attend voluntarily for the purpose.

Servia.

Terms of Service.—In the Standing Army, 10 years, from the completion of the 20th year until the completion of the 30th year; in the 1st levy of the popular Army, 10 years, between 30 and 40; in the 2nd levy, 10 years, between 40 and 50. The period to be passed with the colours is fixed at 2 years, but there are shortened periods of 1 year, of 5 months, and of 1 month. On the completion of the term with the colours the men are passed to the Reserve.

The shortened 1 year's service is permitted in the cavalry for those men who can turn out a horse equipped in accordance with the regulations, and after 5 months and 11 months respectively pass the examinations required for promotion to be a lance-corporal and to be a non-commissioned Officer.

The 5 months' period is applicable only to certain classes of men having specially urgent calls upon them in civil life.

Those only are dismissed after a month's training who are the sole support of a wife and child or of a member of their family unable to work and over 60 years of age.

Organization.—There are 5 divisional districts, each of which, in peace-time, supports the following formations :—

1 infantry regiment of 3 battalions.
1 infantry Guards battalion.
1 to 2 squadrons of cavalry.
1 field artillery regiment, with 6 batteries, each of 4 guns.
1 mountain battery of 4 guns.
1 engineer company.
1 train squadron.
1 sanitary company.

The Royal Horse Guards, the garrison artillery, the horse artillery battery, some technical formations, and the gendarmerie are recruited from the whole kingdom.

In war, every infantry battalion is converted into a regiment of 4 battalions by the formation by each company of 1 battalion. Thus each of the 5 division districts produces 3 regiments of 4 battalions, and the entire infantry of the Standing Army consists of 60 battalions Line and 5 battalions Guard, which are not increased in number on mobilization, but are only raised to war strength. In the cavalry a 4th squadron is added to each of the 3 regiments, and, besides this, 2 squadrons of divisional cavalry are newly raised in each district, thus increasing the cavalry to 23 squadrons, including the Guards squadron. In each of the 5 field artillery regiments 2 new batteries (7th and 8th) are formed; the 5 mountain batteries are increased by 4, and there is in addition the 1 horse battery, total 50 batteries, each of 6 guns.

The 15 infantry battalions permanent in peace form 15 Ersatz battalions, one each, and each of the 5 Guard battalions forms an Ersatz company; there are formed also in each division district an Ersatz squadron and an Ersatz battery.

Neither levy of the Popular Army has any cadre in peace. All the formations, therefore, have on mobilization to be inaugurated. The Officers alone are nominated beforehand. In each division district the following units are to be constituted from men of the 1st levy: —3 infantry regiments, each of 4 battalions; 1 Guards battalion; 2 squadrons of divisional cavalry; 1 field artillery regiment of 4 batteries with 6 guns; also some technical and other formations. From the 2nd levy are formed in each district 3 infantry regiments of 4 battalions; 1 squadron of divisional cavalry, and 1 company of garrison artillery.

Officers.—The official list comprises altogether about 2,000 Officers of all arms on the active and reserve list; but it is to be observed that this number falls far short of the requirements of the entire mobilized Army. In the middle schools there are courses for Reserve non-commissioned officers, and at the University an Officers' course. Students who have passed these schools enjoy the privilege of voluntarily entering the Army after completing eighteen years of age, and availing themselves of the shortened period of service, after which they have to pass the prescribed examination. Other

candidates for the position of Reserve Officer who satisfy the necessary conditions in regard to efficiency are also admitted to the examination. The Reserve Officers rank after those on the active list, and their promotion is carried out in accordance with a separate seniority list.

The Commanders of regiments and the superior Commanders and their Staffs for the national levies are drawn exclusively from the Active Army. In so far as the remainder of the posts are not provided for by Officers drawn from the Active Army or the Reserve, they will be filled by the appointment of old Army non-commissioned officers, and other qualified individuals selected from the several corps, as may be decided beforehand. The authority for their appointment rests, in the case of the leaders of subdivisions, with the Commander of the division concerned; in that of company Commanders, with the War Minister; the appointment of battalion Commander rests with the King. These Officers may be required to improve their knowledge by attending the Officers' course of instruction that has lately been instituted.

Infantry Arm.—The arms in possession are all of the old large bore, and of several different patterns, viz.:—

i. 104,000 Mauser-Kola-Milovanovitz (10·2 mm.).
ii. 72,000 Berdan (10·6 mm.), bought from Russia last year.
iii. 91,000 Peabody-Martini (11·3 mm.).
iv. About 50,000 Krnka, Snider, and old muskets.

Those at i are for the Standing Army; at ii, for the 1st levy; and at iii and iv, for the 2nd levy of the National Army.

The question of rearming the forces with a small-bore magazine rifle, or of converting the existing arm (i) into a repeating rifle, was last year under discussion, but was postponed without any definite decision having been arrived at, on account of the difficulty in regard to money.

A vote of 10 million dinars (a dinar is about a franc) towards rearmament was passed by the Skupschina; but of this sum 4 millions were devoted to other purposes, and the remainder was required for the rearmament of the field artillery, and the provision of guns of position and quick-firing guns.

The existing field gun on the de Bange system has been a failure, for up to the present in peace-time as many as eighty have broken down and become unserviceable. The choice of the gun to replace it lies between Krupp's and Canet's systems.

Horses and Train.—The weakest point in the constitution of the Servian Army is the inadequate arrangement for the supply of the horses and wagons that would be required in war. The existing peace establishment consists of 1,700 troop, and 1,400 draught horses, of which only 30 per cent. are fit for war service. The war requirements may be taken as the following:—

For the Standing Army	9,000
„ 1st national levy	6,000
„ 2nd „	1,500

The required number of train vehicles and draught animals may be estimated at some 16,000 country carts, and 32,000 oxen or buffaloes. The horse conscription made in 1886 provided, indeed, 35,000 horses, but the quality is bad, so that the war requirements in the interior could scarcely be met. But carts with the regular country teams are available in sufficient numbers to meet the requirements for the train.

Establishments.—i. *Peace.*—The regulated strength is the following:—

Officers, Surgeons, and officials ..	1,400
Men.....	19,000
Horses	9,200
Horsed guns	146

But as a fact the effective strength never amounts to anything like these numbers. During the last two years it has not been more than 1,100 Officers, &c., 9,000 to 9,500 men, and 3,000 horses.

ii. *War.*—Standing Army: 65 infantry battalions, 23 squadrons cavalry, 50 batteries field and mountain artillery, 60,000 rifles, 4,300 sabres, and 300 guns.

National Army: 1st levy, 65 infantry battalions, 10 squadrons cavalry, 20 batteries, 56,000 rifles, 1,180 sabres, and 120 guns.

National Army, 2nd levy: 60 infantry battalions, 5 squadrons cavalry, 53,000 rifles, and 800 sabres. Together, 190 infantry battalions, 38 squadrons cavalry, 70 batteries; 169,000 rifles, 6,280 sabres, and 420 guns.

These numbers are imposing, and if they could be relied on in their entirety, would indicate an important increase on the forces hitherto available. In the course of the Russo-Turkish war, Servia gradually placed in the field about 110,000 men; but in her latest war (with Bulgaria) it was not possible to mobilize more than about a half of this number, and at the present time it may be accepted that Servia would not do much more than she did then. On mobilization, by about the twelfth day, the Active Army could be mobilized; but from the numbers given above, 20 per cent. at least would have to be deducted for casualties, on account of absentees, sick, &c., which would leave, perhaps, 50,000 fit for service. After about a month, in the most favourable conditions, some 40,000 to 45,000 men of the 1st levy might be organized, and in two months from 35,000 to 40,000 men of the 2nd levy. These numbers together would amount to from 125,000 to 130,000 men, and this is probably the greatest number that could gradually be embodied by Servia to resist any serious attack such as would threaten her existence as an independent State.

Spain.

The reorganization of the Army was last year effected on the lines stated below, and the changes inaugurated by it came into force on the 1st July, 1892. The Peninsula, together with the Balearic and

the Canary Islands, was divided into 111 zones. The size of these corresponds to the number of men borne on the lists of the district, which is not to exceed from 6,000 to 7,000 in each district. The annual contingent numbers about 700 to 800 men per district.

On an average, 86,634 recruits are taken yearly for the Army, of whom 6.634 are required for the force stationed out of the country and for the marines.

The period of service lasts twelve years; consequently in war the Army should consist of 12 yearly contingents of 80,000 = 960,000 men. But from this number has to be deducted 20 per cent. for casualties, &c., leaving 768,000 men available, which is still further reduced to 680,000 to allow of the margin it was thought necessary by the War Minister to allow.

The country is further divided into 16 military recruiting districts, each of which provides for one division, the headquarters of which are situated in the district. Each of these comprises a certain number of zones.

The garrison artillery recruits by battalions, of which there are 10 in the divisional district or districts allotted to them.

Each zone is commanded by a Colonel, who has under him 2 Lieutenant-Colonels, 2 Majors, 6 Captains, 2 First Lieutenants, 3 sergeants, and a number of corporals and privates. These form in part the cadre of a depôt battalion, and also regulate and look after the recruiting lists, the calling up and distribution of the recruits, the men on furlough, and the Reservists of the 1st and 2nd classes. There is further in every zone a Military Statistics and Requisitions Committee, composed of cavalry Officers and the necessary number of men.

The previously existing 68 Reserve regiments, 58 3rd battalions of the active infantry, 10 depôt rifle companies, 28 Reserve cavalry regiments, 7 recruiting and Reserve artillery depôts, and 4 Reserve regiments of engineers have been done away with.

Infantry.—Composition, 16 divisions of 2 brigades each of 2 regiments of 3 battalions. Provisionally the rifle battalions are to take the place in certain divisions of infantry regiments that have not yet been formed. In peace-time the 3rd battalions will consist only of a permanent cadre, which on mobilization would be expanded by means

Reserve men of the 1st class. At the present time there are 56

ine regiments garrisoning the Peninsula, 2 in the islands, and 3 in North African possessions. The 2 regiments in the Balearic Islands from an independent brigade, and the rifle battalions in the Canaries a half brigade. The whole of the troops are furnished with the vehicles they will require on mobilization, the horses for which would be obtained by requisition.

The peace strength of a Line regiment will in future be 54 Officers and 824 other ranks; the company is consequently about 100 strong. In war it is 250; the total strength of the regiment is then raised to 84 Officers and 3,026 other ranks.

Cavalry.—Although 16 of the existing 28 cavalry regiments are to be attached to the divisions, still the cavalry is in peace to form still

10 brigades, which are distributed to the several division districts. In war, out of the regiments still available, will be formed a cavalry division of 6 regiments; 5 will be attached to the Army Corps that will then be created, and the squadrons at Majorca will provisionally form the reserve. Every cavalry regiment will consist of 4 active and 1 depôt squadrons; also 1 escort section. The squadron, 114 strong in peace, is to be raised to 175 on mobilization.

The establishment of a regiment is in peace 38 Officers and 460 other ranks; in war 47 Officers and 770 others.

Artillery.—The number of field artillery regiments has been increased by 4, making a total of 16 regiments, of which 9 are to be armed with 8-cm. guns, 5 with 9-cm. guns, and 3 with 8-cm. mountain guns. In peace each regiment consists of 4 batteries of 6 guns and 1 ammunition column; in war there are 8 batteries of 6 guns as well as 2 artillery and 2 infantry ammunition columns. Besides the field artillery regiments, there are to be 3 batteries of horse and 10 battalions of garrison artillery.

The field artillery regiments have a peace strength of 35 Officers and 513 (or 573 for those with 9-cm. guns) other ranks, which is increased for war to 76 Officers and 2,096 (or 2,248 for those with 9-cm. guns) others. The composition of the regiments of mountain artillery differs little from that of the field.

The peace strength of a horse battery is 4 Officers and 115 others; in war 5 Officers and 173 men. These batteries are armed with 6 8-cm. guns.

Of the garrison artillery one battalion (the 1st), consisting of 6 companies, has in peace 34 Officers and 630 other ranks; in war the number of Officers is not changed, but the other ranks are increased to 1,519. The remaining 9 battalions have a peace strength of 25 Officers and 426 other ranks; in war the numbers are raised to 30 Officers and 1,026 others.

Engineers.—This arm consists of 1 telegraph battalion, 1 railway battalion, 1 pontoon regiment, and 4 regiments of sappers, 1 company of which is allotted to each infantry division.

The telegraph battalion has in peace 29 Officers and 626 men; in war 75 Officers and 1,250 others. The railway battalion consists in peace of 27 Officers and 806 men; in war of 32 Officers and 1,045 men.

The peace strength of a regiment of sappers is 49 Officers and 806 men; in war the number of Officers remains the same, but the other ranks are increased to 2,006.

Sanitary and Administrative Formations.—These have been completely reorganized, and are to consist of a brigade of 16 companies, one to each of the divisions.

The strength of the brigade in peace is 4 Medical Officers, and 1,033 others. In war each company forms 2 brigade ambulances and 1 divisional ambulance.

Besides the medical personnel and administrative officials, there are with each ambulance 170 of all ranks, also 60 bearers, 49 drivers and leaders for the mules, 30 vehicles, 60 draught and 37 pack mules.

The administrative troops are formed on the same lines, in a brigade of 16 companies, of which 1 is attached to each division during peace. Fourteen of the companies are mounted, and the other 2 are mountain companies. For service in the Balearic and the Canary Islands there is a mounted section, and a mountain section for North Africa. The establishment in peace is 18 Officers, 1,436 men; 24 troop and 8 Officers' horses, 384 mules, 82 field ovens, 60 carts, and 600 baggage wagons; in war 126 Officers, 4,845 men, 277 troop and 83 Officers' horses, 3,892 mules, 70 field ovens, 2 carts, and 20 baggage wagons.

Turkey.

Strength.—In consequence of the reinforcement of the troops in Yemen during the course of the year, the number of combatants in the Turkish Army was increased to 185,000 men; the total rationed strength, including all non-combatants, was about 250,000.

The estimates that have appeared in various publications of the strength of all the armed forces available are excessive. The following appears to be the paper strength of the several portions composing these forces:—

1*st*, *Muassaf* (*Active Army*):	
i. Permanent list of Officers and of non-commissioned officers serving beyond their legal period as candidates for appointment as Officers	25,000
ii. Six yearly classes, 1st category, 1st portion	240,000
iii. Six yearly classes, 1st category, 2nd portion	30,000
Together	295,000
2*nd*, *Redif* (*Landwehr*):	
The 1st, 2nd, 3rd, 4th, and 5th Corps furnish at present each 64 Redif battalions of 1,000 men	320,000
The 6th Corps has only 17 battalions	17,000
Active Army and Redif together	632,000
Ditto, after deducting 15 per cent. for absentees, casualties, &c.	537,000
3*rd*, *Mustahfiz* (*Landsturm*):	
The six yearly classes after allowing for absentees, casualties, &c. They have no cadres or organization	120,000
Total	657,000

To this number might be added about 150,000 men from all sources, volunteers, irregular troops, &c., thus giving three quarters of a million of men, who might in time be utilized in the event of a great war in which the existence of Turkey was at stake. This is not unsatis-

factory if the losses in territory, and consequently in men, which she has suffered be taken into consideration. Turkey may be well satisfied if at the commencement of a war she is able to put in the field 400,000 men, as she did in the Russo-Turkish War, with the knowledge that in the course of the war she could count on the services of nearly as many again,

Reorganization.—The introduction of a three years' period of active service, prescribed by the Recruiting Law of 1887, has not yet been given effect to. At the present time there are four annual classes with the colours. The number of men, estimated at 23,000, of the Tertib-sani (Muassaf: 1st, category, 2nd portion) has fallen far short of this estimate. In 1888 they numbered 14,000, of whom about the half were called up, and were kept three to seven months longer under arms than the five to seven months' training prescribed by the law. Those called up in 1889, about 4,000, have not yet been dismissed. The rest of the 1889 class and all that for 1890, together about 5,000 men, were employed to complete the establishments of the troops employed in quelling the insurrection in Yemen. The training of the Kiam-sani, the men of which are not called up at all, the restricted training prescribed by the law has not been carried out. In the same way the regulated exercises for the Redif have been entirely neglected, which is to be particularly regretted, looking to the numerous occasions on which partial mobilizations have during late years become necessary.

Reserve Officers.—On the occasion of the last partial mobilization on a large scale (1885–86 conflict with Greece), some of the Redif regiments had to march with only 10 or 12 Officers. The Reorganization Committee considered how best to remedy this unsatisfactory state of affairs, and drafted regulations providing for the selection after examination of suitable non-commissioned officers during peace for appointment as Officers of Redif. They have been referred back twice for revision, and for a long time allowed to drop; but they have been taken in hand again lately.

Recruiting Districts.—Five years ago sanction was given for the 192 previously existing recruiting districts to be divided, each into two, and for the boundaries of the new districts to be drawn according to the conditions of population. The changes have not yet been carried out, and only in September, 1891, was an order issued for their adoption in the 1st, 2nd, and 3rd Army Corps, the headquarters of which are at Constantinople, Adrianople, and Monastir. The delay has been caused by various unforeseen difficulties, and it has been necessary to obtain complete statistical information and proposals from the several Army Corps commands. In the first three the arrangements for effecting the change are now in course of execution. In the 4th Army Corps (Erzeroum) the new map is being drawn up; in the 5th (Damascus) the statistical researches have not as yet been completed; and in the 6th (Bagdad) nothing whatever has been done, and it is dubious whether the change will be effected at all.

The early completion of this reorganization of the recruiting districts is urgently necessary, both in the interests of recruiting in

peace and of an eventual general mobilization. Many of the old recruiting districts are too large, some are too small. The company districts also are in many cases too extended or too far distant one from the other. The Sivas district in Asia Minor has 32,000 men on the register, Adrianople has 9,000, Van, in Asia Minor, only 8,000. Yet all have to furnish on mobilization an equal number of troops. It follows, as was observable on the occasion of the partial mobilization of 1885–86, that whereas in the one district the task was simple, and rapidly completed without hardship to the inhabitants; in the other, instead of days, weeks were occupied by the mobilization, which then was only completed by means of undue pressure and much hardship.

Strength of the Active Army.—There were in 1891, 7 Army Corps, the headquarters of which were respectively at Constantinople, Adrianople, Monastir, Erzeroum, Damascus, Bagdad, and Yemen. There were besides 3 independent divisions in Crete, Arabia, and Tripoli. The total number of units in these commands was 281 battalions, 195 squadrons, 15 horse, 152 field, and 41 mountain batteries.

Infantry Arm.—The situation has not been changed, and it is not at all a satisfactory one. There are in possession the following different patterns :—

i.	Mauser, Belgian, M/1888, small-bore	30,000
ii.	„ M/1887, large-bore	220,000
iii.	Henry-Martini	510,000

The intention has been to convert the Henry-Martini into a small-bore arm; but it appears that only about 60,000 are new, and the remainder have experienced much rough usage between the Russo-Turkish War and the various partial mobilizations that have since taken place. On the other hand, the Mauser M/1887 have never been issued. They might therefore be converted, and the Reserves armed with the unaltered Henry-Martini, if arrangements cannot be made for the purchase of 250,000 to 300,000 more Mausers M/1888 for their use.

The case of the ammunition is even worse : some 83 million cartridges have been delivered for the Mauser M/1887 and a further consignment of 17,000 has to be completed. No cartridges whatever have as yet been ordered for the M/1888 rifle, and the nature of the smokeless powder to be employed with them has not been decided on.

Fortifications.—The defences of Erzeroum, commenced in 1883, were in the main completed, so far as the construction of the works is concerned, five years later. But they are in great part useless, owing to the want of guns for their armament. The system of defences comprises citadel, enceinte, advanced works, and an intrenched camp. Of these the intrenched camp includes 13 forts, the armament of which was fixed as long ago as 1882 at 163 guns (24-, 18-, 15-, 12-, and 9-cm.), 116 mortars of heavy calibre, and 69 quick-firing guns. But the whole of the ordnance available for arming the entire defences only amounts to about 400 guns and mortars, of which about 50 are Krupps.

The new forts have the gorge closed, they are cut in the rock or well covered by masonry, have well secured underground shelter and magazines, and may be considered generally as capable of a good defence. The extent occupied by the intrenched camp is too great; for at least 25,000 men would be required even for a purely passive defence. In laying out the forts too much was attempted; in some cases, where two forts have now been constructed, one on a carefully selected site would have sufficed. But in general, when it shall have been fully armed and provided with a sufficient army both for the defence of the works and for offensive operations, Erzeroum will fulfil the object for which the works have been constructed. It is the key of Armenia and Anatolia.

As regards the works on the Bosphorus, the Rumeli Kavak battery, commenced some years ago, is not yet completed.

In the Persian Gulf orders were issued in 1891 for the reconstruction of the works of Beriman and the construction of a small work at Alia not far from Bassorah.

On the Greek frontier, in the Government of Janina, the construction of a series of defensible block-houses was commenced. These are distributed as follows:—2 on the Saranda road, 4 at Haimara, 4 at Delonia, 2 at Psilates, 1 at Metzovo, and 1 at Milo, near Metzovo.

Training of the Troops.—The artillery is instructed by means of the German Field Artillery Regulations. A portion of the Guard infantry are trained in accordance with the German Regulations introduced by the German Military Mission; but the rest of the infantry and all the cavalry are instructed by means of translations dating back to 1875.

There is no such thing as a regular systematic instruction in shooting exercises in the field, nor are there regular inspections or manœuvres (the 39th Division only, stationed in Tripoli, was reported to have held manœuvres in February last on the Ainzara plains). The instruction of the Turkish soldiers of all arms stationed in Constantinople is limited to what can be learnt on the small drill grounds situated near the barracks. In the other Army Corps districts some rifle practice (in 1890 in the 3rd Corps only, and not more than 3 rounds; in 1891 in a few garrisons equally with a very small number of rounds); here and there also artillery practice.

Cavalry.—As regards the raising of Kurdish mounted regiments, which has been spoken of for the purpose of completing the Turkish cavalry, account cannot be taken of them for the reinforcement of the 195 squadrons of the Regular cavalry. The above—and they are insufficient for the purpose—can alone be counted on for furnishing the divisional cavalry and forming a cavalry division. As cavalry of a second order, the Kurds, who may in some degree be likened to the Cossacks, will be able to do good service in their own country, that is, in the sphere of operations in Central Asia. From the registers made in the 4th Army Corps district of the Kurdish tribes in the vicinity of Van, Bitlis, and Musch, material is as yet available for 64 regiments, each 500 to 600 strong.

But there are only 6 regiments actually formed and mounted, and

28 more have half the number of horses required, and will be completed in the spring. The organization of Arab horsemen—planned at the same time as that of the Kurdish cavalry—from the nomad tribes in the vilajet of Mamuret-ul-Aziz and in other parts has not yet been carried out; but in this vilajet alone material sufficient to form 3 regiments have already reported.

Artillery.—The scheme for the reorganization of the field artillery, referred to in the Reports for 1890, is being carried into effect. Previously each of the first 6 Army Corps had had 2 regiments of from 12 to 17 batteries. There was besides in the Guard Corps a model regiment with 14 batteries. By the new organization each of the first 6 Army Corps is to have 6 regiments of 2 divisions, each of 3 batteries with 6 guns (1 mountain battery per regiment), and there will be also a division of horse artillery of 3 batteries for the cavalry division.

This would necessitate the formation of 10 new batteries per corps, together 60 batteries. But the model regiment is to be broken up; so the number to be raised is reduced to 46.

The new distribution was commenced in the 1st, 2nd, 3rd, and 4th Corps at the end of October, and is completed in the 3rd Corps. In the 1st (Guard) Corps it is also completed, except that the 6th Regiment has not received its horses, and the 5th Regiment has only its horses for the mountain battery. The new regiments of the 2nd Corps still require almost the whole of their horses. In the 4th Corps the new 3rd and 4th Regiments are complete; of the 5th and 6th Regiments, only the mountain batteries have been as yet formed. In the 5th and 6th Corps (Damascus and Bagdad) nothing has been done.

In all, there are still 39 guns required to complete the new organization and a large portion of the horses; the ammunition wagons are also wanting.

The redistribution of the recruiting districts and the increase to the field artillery are both important reforms. There remains to be dealt with:—

i. The revision of the corps of Officers of a sufficiently thorough nature to ensure the removal of all those Officers who through age or unfitness are not equal to the command of troops in the field.

ii. The introduction of a regulated and efficient method of training the troops for service, and especially the instruction of the infantry in rifle practice.

iii. The armaments of Erzeroum and Adrianople and the proper protection of Constantinople.

The political conditions on the old European theatre of war are more unfavourable for the Northern enemy than formerly. The Asiatic theatre of war can now, as formerly, only play a secondary *rôle*. It appears, therefore, certainly possible that Russia may in future attack directly, by the shortest route, the object for centuries of her desires and endeavours, and attempt to overwhelm Constantinople by a landing. The chances of the success of such an undertaking have been discussed elsewhere, and here it need only be

remarked that this Cossack *coup* can be effected without difficulty, if Turkey will not at the last hour take corresponding precautionary measures.

Infantry Tactics.

General Considerations.—The surprisingly powerful impression called forth by the introduction of smokeless powder and the small-bore magazine rifle has gradually given way to a quieter examination. We have become accustomed to examine in cold blood the enormous revolution in the matter of tactics which came about so suddenly, and to look fearlessly and resolutely to the future. The year 1891 has passed in peace, and the solution of the pending question by means of practical experience on the battlefield is reserved, therefore, as before, for the future.

The central point round which all questions of infantry tactics revolve is, naturally, the accomplishment of the infantry attack. And in this strong contradictions present themselves. It is acknowledged on all sides that no attack has any prospect of success unless an unquestioned superiority of fire has been previously obtained. But in almost all the armies of the greater European Powers, the principle is accentuated, that it appears imperative in the attack to advance quite close to the enemy, so far as this is possible, without stopping. How, notwithstanding, to obtain superiority of fire over the defenders, occupies the active minds of the infantry Officers of all European armies. Manifold proposals have been made on the subject; but none of them has hitherto proved entirely successful.

The simplest way appears to us to be to develop to the highest possible degree the power of the artillery. Here unconditional superiority over the enemy is the indispensable condition of success, and this is not simply a superiority in the number of guns, but rather superiority in the accuracy of fire, the readiness to fire, and mobility, combined with superiority in the effect of projectiles.

In a future war we expect to see the artillery play a still more decisive *rôle* than it did in 1870–71; provided the German artillery is then able to take the first place, our infantry attacks will also succeed.

We believe further that in this matter also, as is so often the case in life, green experience will gain a victory over grey theory. Attacks such as that on St. Privat will prove the rarest exceptions. The ground will far more frequently offer material advantages to the attackers, and it will then only be a question of utilizing these advantages as skilfully as possible. We are inclined to think that the constantly unaltered appearance of the beloved drill ground may have led many earnest and thoughtful Officers to perceive difficulties which will in reality seldom exist. But if a field of attack should be encountered that extends over ground similar to that at St. Privat, that is, over a glacis-like rising, completely unprotected slope without any cover, why then a decision will have to be sought at another spot that is more favourable. Attacks such as that at St. Privat will

in future only be possible when the attackers' artillery has completely smashed up that of the defenders, and has afterwards been directed for hours on their infantry, so that if not by means of the dreadful losses suffered, still by being thoroughly shaken, their moral power shall have been destroyed or materially weakened.

No one can now think that the decision at St. Privat should have been undertaken in a manner even approaching to that which unfortunately was actually adopted. Great mistakes were indeed made on the 18th August, 1870.

On other portions of the battlefield as well, the attackers were in a position to have secured a victorious decision of the battle. Anyone who wishes to be thoroughly instructed on the matter should read the latest book by Fritz König, on the Battle of Gravelotte.

The dispute about the "normal attack" goes hand in hand with the execution of the infantry attack. Lately, three of our most noted military writers have expressed themselves on the subject of the "normal attack."

General Bronsart v. Schellendorff, since deceased unfortunately, has, in a very clever paper, attempted to prove that in Germany our regulation instructions are all we require. General z.D. v. Scherff, equally in an important paper, has dwelt on the necessity for certain binding directions for the attack of infantry; that is, he favours in principle the "normal attack." And lastly, Lieutenant-General z.D. v. Boguslawski has expressed it as his opinion that a "normal attack" is only necessary for fighting in open ground.

It stands to reason that the publications of three such experienced and distinguished Generals have called forth a flood of discussion. In spite of everything, we have not got much nearer to the matter; and nothing has been contributed towards it abroad.

In view of the divergency of such acknowledged authorities, might not a simple instruction meet the case, such as "attack over an open plain, that does not offer the least cover, will, in future, be only undertaken if the Officer conducting it is firmly convinced that the enemy has been thoroughly shaken and discouraged; the Officer Commanding will answer with his head that deceptions such as that at St. Privat are avoided in future"?

The daily repeated and almost uniform appearance of the drill ground bears wonderful fruit. How often, then, do we work in large bodies in the field? How seldom do we find in the field a plain without cover?

The impossible remains impossible. Whatever may be devised, however clear a "normal attack" or none at all, on the naked plain without cover, every assailant will be shattered if the defenders are still in a condition to shoot and aim their fire. It is rather indifferent whether the attackers attempt to advance by one movement without halting to within 500 m. of the enemy or still nearer, or to take up a succession of "firing positions" one after the other before they occupy the "main firing position." On either supposition, the losses will be overpoweringly great, for the defenders, lying covered, offer only half-head targets, whereas the attackers, in their complete

absence of cover (as is supposed), offer alternative whole-figure targets advancing and whole-figure targets lying down. To this may be added that the defenders will generally know the correct distances. The chances, therefore, of hits on the part of the defenders are increased immensely, whereas the attackers have as good as no hopes of making hits. If any one should doubt the justice of this assertion, we would recommend him to observe the results as regards hits of the firing of a body of troops specially trained to rifle practice, such as the infantry school of musketry for instance, when the practice is at half-head targets at distances over 500 m.

If the Russians and French believe they can obviate these difficulties by the dash of their attacks, so much the better for us. We will leave to them the practical application of the doctrines of a Dragomiroff, for whom the experiences of Plevna simply appear to be non-existent. But the Germans will do well only to attack seriously and seek a decision where the ground offers the possibility of a complete result from the attack. Should, however, the German artillery succeed in shaking the enemy in the degree referred to above, the infantry may then be able to act successfully in less favourable ground. In any case we need not rack our brains over the question "normal attack or not?"

We are prepared for a storm of indignation from those who hope to enforce the attack over open ground, destitute of cover, by subtleties in peace, because we simply deny the possibility of such an attack succeeding, unless the enemy has been almost completely shattered by the attacker's artillery previous to the assault. This will not, however, prevent us from expressing our conviction. We greatly admire the old German courage, but we have not the least taste for the modern "dash" of posterity.

Since the introduction of firearms we have been undergoing a continuous process of great progress, a process the end of which cannot be foreseen. From of old, knightly heroes have attempted to fight for the impossible; but they have always succumbed to the constraint imposed by the limit of human attainment. Hardly in any times have braver warriors fought on a battlefield than the French knights who fought at Pavia in 1525. These knights looked down with the greatest disdain imaginable on the despised arquebusiers of Charles V, and still they succumbed almost to the last man, notwithstanding the most knightly and heroic courage which they showed, not only by words, but also on the battlefield.

And to-day something is haunting many heads that calls to mind those French knights. May we avoid the necessity for another St. Privat to teach us what we are justified in expecting from infantry attacking over open ground destitute of cover, even when it is not packed as close together as the German infantry in 1891.

A further question that is occupying all armies is, in what manner the attack is to be supported by firing during its advance. A number of persons are in favour of the line of shooters, while pressing forward, maintaining on the move an uninterrupted fire. The French actually carried out attacks of this kind in 1870–71, at Wörth for

instance; they have, indeed, gained temporary advantages by them. Still, the value of this kind of fire, delivered while running forward, appears, at least, very doubtful. In no case do we believe that the difficulties offered by an attack over open ground devoid of cover could be surmounted by means of it.

And, lastly, the question of reconnoitring during the actual fight is being eagerly discussed in all armies. It centres itself upon whether or not mounted infantry patrols should be introduced. It is not within the scope of this report to give a judgment on all these questions; but we cannot refrain from remarking that before an engagement, indeed both before and after, reconnaissance will continue to be a matter for the cavalry. Where a cavalry patrol is unable to gain a knowledge of the enemy's position, a mounted infantry patrol is hardly likely to be more successful.

But during the actual course of the fight under the effective fire of the enemy, mounted men will only very exceptionally be able to ascertain anything, for the enemy's fire will prevent them doing so. But supposing it to be possible, we see no reason why the cavalry could not perform this duty just as well as mounted infantry patrols. If cavalry are wanting in a sufficient knowledge of the fighting conditions of infantry, the deficiency can be very easily supplied; it is only necessary to practise, as often as possible, fighting exercises with troops of all arms, as, happily, is already extensively done. This would, anyhow, be simpler and cheaper than to introduce mounted patrols for infantry. We cannot, either, altogether shake off the impression that the introduction of these mounted infantry men would resolve itself in practice oftener than is desirable into a kind of sport. Let us leave mounted sports to the Officers, and not extend them to the non-commissioned officers and men of the infantry.

Abroad, attempts have been made to utilize cyclists with the infantry for carrying reports. There might be advantages in this in connection with outpost duties; in the greater operations of war we do not anticipate they will be of much use.

Germany.—A very interesting essay in the "Militär-Wochenblatt" (No. 25, 1891) explains thoroughly the great inconveniences with which the tactical instruction of the infantry has to contend in Germany, and recommends a radical change of the system hitherto followed. Although we are unable to agree with all the writer's proposals, still we consider the essay so important that we propose to discuss it here pretty closely. The writer finds fault with the existing instruction in the following particulars:—

1st. During the whole year the training for war, as designed, is frequently disturbed and restricted, both as regards the leaders and the men.

2nd. The instructional personnel are often unfitted for their duties.

3rd. The time of year and the utilization of the country are not arranged with due regard to the new requirements, and, in consequence, the time allotted cannot be so completely and appropriately employed as could be desired.

The writer now proposes that recruits for the infantry and jägers should only be called up every two years, in doing which the Army Corps must alternate: that is, one half of the Army would receive its infantry recruits in the even, the other half in the uneven, years. The period of service would remain three years, the engagements of the non-commissioned officers would be always for two years, so that their termination would not be identical with that of the men. The period of instruction would extend over two years and be divided into the following portions:—

1*st Section.*—From the 1st October to the 1st February of the following year: Recruit instruction. Every Officer and non-commissioned officer to retain permanently the same men under his command. No replacement or transfer of Officers or non-commissioned officers to take place during the first year. At the end of January the inspection of the recruits to be held by the Battalion Commander.

2*nd Section.*—From the 1st February to the 31st March: The instruction in subdivisions. Inspection at the end of March by the regulated Field Officer.

3*rd Section.*—From the 1st April to the 31st July: Drill of the company, field duties, individual and field firing, swimming, gymnastics, fencing, and field pioneer duties. Inspection in each branch of duties by the Regimental Commander.

4*th Section.*—From the 1st August to the 30th September: Instruction in battalion and in regiment. Exercises of companies and battalions against one another, bivouacs, field firing. Small cavalry detachments to be attached for patrolling and reporting duties. The last 10 or 12 days' exercises to be in brigade, with about 2 squadrons and 2 batteries, if this can be arranged for.

In the first year no detachment or divisional manœuvres to be held; a 14 days' General Staff tour with Officers of the intendance attached, conducted by the Divisional Commander.

In September the one-year volunteers to go up for their examination for Reserve Officers; but during the whole year not to be employed as instructors.

5*th Section.*—From the 1st October until the 28th February of the following year: Repetition of the instruction in groups and in subdivisions. The Officers and non-commissioned officers not on the active list to take part in the instruction. The men to be thoroughly accustomed to be commanded by different Officers, in contradistinction to the first year. Formation in bodies at war strength.

6*th Section.*—From the 1st March to the 31st July: Continuation of company exercises, field duties, applied gymnastics, bayonet fighting, swimming, principal firing period.

7*th Section.*—From the 1st August to the 30th September: Embodiment of Reservists and Landwehr men. Formation of battalions at war strength. Manœuvres up to the Army Corps, two Army Corps opposed. As far as possible all the Officers not serving actively to occupy the places they would hold in war.

Employment of Jägers.—The "Militär-Wochenblatt" (Nos. 63—

65) has an interesting article on the employment of the jäger troops in war. The writer draws attention to the advantages possessed by these troops in being recruited from a class of men who have already on joining important qualifications, such as medium height, powerful physique, good sight, good education, and for the greater part facility in the use of a rifle. He dwells also on the excellent instruction given them for employment in the field and in shooting, and comes to the conclusion that the jägers are superior to the infantry in fighting value and handiness. The writer would consequently employ them in the following manner:—

1st. To protect the mobilization and concentration.

2nd. During the advance against the enemy, the battalions of all the Army Corps marching on one road, from two to three battalions would act as a support to the cavalry division in front, open out narrow places, and protect its rear.

3rd. In the actual battle they would act:—

i. As a reserve for pursuit or for covering the retreat.
ii. In front of the artillery line for its protection.
iii. In wooded ground.
iv. To support the infantry attack, either from a flank or by firing over their own infantry if the ground admits of this.

4th. With the rear guard.

5th. In fortress warfare.

6th. In minor operations.

In these proposals there is much worth taking to heart, the employment of the jägers to protect the area of concentration during the mobilization seems to us especially very appropriate. The Russians, it is known, expect great things from inundating an enemy's territory at the commencement of a war with their masses of cavalry. It appears to us the proved dexterity of our jägers in shooting would be well adapted to place a limit to Muscovite arrogance. The second point equally is well worthy to form the basis of technical discussion.

Pioneer Regulations.—The new edition of the Field Pioneer Instructions of 1890 is worthy of joining the new Drill Regulations and the Musketry Instructions, and are excellent. They lay stress on the point that the ground must always be regarded, and only the natural cover need be strengthened; the form is only an accessory. The parapet should not be raised higher than is absolutely required to allow of overlooking the ground in front; the firer must get up as close as he can to the cover.

The absence of smoke from the powder, the enormous increase in the flatness of the trajectory as well as the greatly increased penetration of the bullet have led to a complete revolution in the matter of field fortifications. Even at great distances, the angles of incidence are very small compared with formerly; the value of artificial cover has consequently come into greater prominence. The increased penetration of the bullet necessitates a material strengthening of the covering parapet. But if this be sufficiently strong, the defenders

have little to fear from the infantry fire of their opponents; it is only the shrapnel fire of the artillery that threatens them with destruction. In view of the greatly increased effects of shell-fire, villages, hamlets, and walls have all lost more or less their value as cover. Still more than formerly earth-works form consequently the only effective shelter.

Inclosure walls, which in Germany are mostly of moderate thickness, are now pierced by infantry fire, when several bullets hit the same spot. This is especially the case with brick walls, and it is, therefore, necessary to provide a thick backing of earth. It is best to cut such walls down to the height that will enable men to fire over them; openings to fire through are not desirable; it is better to make use of banquettes. But regard should be had to the fact that the higher the object is placed, the more destructive will be the effect on it of artillery fire.

Earthen parapets are, therefore, always the best, against infantry fire a thickness of 1 m. will suffice; they should be kept low, and for choice excavated in the ground. Obstacles are only of value when the attackers can be seriously checked at a distance of from 250 to 400 m. from the defenders, exposed to the hottest fire. No closed intrenchments; a couple of well aimed shrapnel will destroy the occupants.

The construction of several lines of earth-works one behind the other; the 1st line completely cut in the natural ground; the 2nd, 50 to 100 m. behind it, half excavated and half built up; the 3rd, in the form of a parapet, again from 50 to 100 m. behind the 2nd.

Woods are of value for defence only when cover can be constructed 20 to 30 m. in front of them. Hamlets are altogether unsuitable.

For the attackers, ridges, undulations of ground, railway or canal embankments, and hollow roads have an increased value.

Musketry Instruction.—The training of the troops to fire under service conditions is coming more and more prominently forward. The most important consideration is for the firing to be carried out as it would be in the decisive phases of a fight. In Germany a sufficient value is given to individual firing under service conditions; but this is not so much the case as regards firing in bodies. The influence of the Company Commander must be more assured than is now the case, when frequently the field firing is conducted by the Battalion Commander, and even bodies at war strength are formed for the purpose.

Too high a value should not be placed on the guidance of the fire, for in reality it can only be done in a limited degree. We have taken a step backwards in this respect since Metz. At first it was wished, if possible, to entrust the Battalion Commander with the conduct of the fire, then to the Company Commander; later we were inclined to think that the subdivision leader was the individual who could most appropriately guide the fire; now the perception is constantly gaining ground that probably the subdivision leader even will not always be in a position to exercise the desired influence on

the conduct of the fire, and that the individual action of the men themselves is rather the end to be aimed at.

Consequently judging distances will be of increased importance, and this from the lying-down position, for in action firing will take place almost exclusively lying down. Not only the Officers, but also the non-commissioned officers, should, therefore, be provided with field glasses, and practised in the proper use of them, with special reference to judging distances.

It is of great importance that in field firing targets corresponding to service conditions should be used, regardless of favourable scoring results; therefore head, or even half-head, targets should be employed at ranges of from 500 to 800 m., for on the offensive it is at these distances that a decision as to the superiority of fire will be arrived at.

With regard to the question of long-range fire, the opinion seems to incline towards it for the defenders, and to short-range fire for the attackers. If the objects to be aimed at in either case be kept in view, and results of firing at these objects in peace be considered, we are prepared to assent to this opinion.

France.—The "Spectateur Militaire" returns to its favourite idea of portable shields. They would be 2 m. high, 1 m. broad, and constructed of two steel plates 3 mm. thick with a space of 5 cm. between them; weight 30 to 40 kilos. They would be carried in front of the assaulting columns by strong men. An Army Corps would have 500 of these shields, which would be transported on wagons. They would be erected 300 m. from the enemy's position. We will give our opinion on this very briefly. It is this: that we shall be delighted to see these shields employed by our enemies. Experience with them in the field would soon afford ample enlightenment regarding their practical applicability.

The chief interest centres about the extensive autumn manœuvres which, in 1891, were carried out on a more extensive scale than had previously been witnessed in France. Four Army Corps (Nos. 5, 6, 7, and 8), a brigade of marines with 3 marine batteries, a provisional rifle battalion, and 2 independent cavalry divisions took part in them; in all 114 battalions, 80 squadrons, 89 batteries.

General Saussier issued the following directions for the manœuvres: "The troops of the 1st and 2nd lines, which would be weakened by their losses and shaken by the previous course of the action, will not be able generally to carry it through to the assault; this is therefore left for the 3rd line, composed of the reserves, that will have been brought as close up as possible by utilizing the cover available. The formations for it will be either company columns with sufficient intervals but with a single objective, or battalion columns in échelon, or open double columns, &c. The assault must never be undertaken from too great a distance, and it must be carried out without firing, only a steady advance. Other troops must prepare the assault by means of rapid firing."

We think we shall best serve the reader if we reproduce several

criticisms on these manœuvres, emanating principally from French pens, from which everybody can draw his own conclusions.

1*st Criticism.*—The manœuvres led to improbable representations, because it was known beforehand who was to win. The defence remained inactive in positions without depth; the defenders often played only the *rôle* of targets, who only had to succumb and must not attempt to evade being defeated. Attacks often took place without regard to the enemy or the ground; an endeavour was always made to attack in flank without engaging the front; hence weak and disconnected attacks everywhere; impossible assaults without coherence, without judgment, and, in spite of this, successful at the onset. By no means sufficient attention was paid to infantry fire.

In France even the Officers are not sufficiently instructed regarding the trajectories of the rifle bullet, and the principles resulting from this. It is not the fault of the Officers, but of the higher control that does not raise the Officers to the proper standard.

2*nd Criticism.*—The marching performances of the infantry at the manœuvres were good. The fire-discipline was excellent; the Officers proved themselves most skilful; but pressure to go forward was still observable in an abnormal degree. Attacks took place without regard for the effect of the enemy's fire, without the attackers utilizing their own fire. Especially in the 7th Army Corps the shooting line was formed in one rank in spite of the thickening that had taken place as the position was approached. The front of the battalions was too extended, and there was confusion in deploying. In this respect more quiet is to be observed.

3*rd Criticism.*—The deployment in fighting formation and the march across country took place too early, before the troops had come into contact with the enemy. The assault was not always thoroughly prepared; the ground was not sufficiently utilized. The word was always Advance! without strength in the front. Impossible assaults without cohesion. The different tactical instruction in all the Army Corps is regretted; each General Commanding a corps has his own principles—one prefers the long thin lines, another the column tactics, while a third adheres to the regulation pattern. This cannot be otherwise under a War Minister who understands nothing about the training of troops for war; a uniform instruction was wanting; the French Army has only an army, but no head.

The "Spectateur Militaire" of October, 1891, contains a detailed account of the manœuvres.

An interesting publication of 1891 was "Quelques indications pour le Combat," by General Ferron. He prescribes 400 m. as the limit of extension of front of a battalion in the attack, and 500 m. as its depth. But for the defence he would allow the front to be increased to 500 or 600 m. In this he is at issue with the German regulations, by which the front of the battalion is restricted both in the attack and on the defence to 400 m. For fighting on the defensive in large bodies, such as an Army Corps, General Ferron's system offers evident advantages; an Army Corps, by reason of the weaker occupation of its shooting line, can hold ready proportionally

stronger forces for the counter-attack; and the counter-attack is the main point. For the larger bodies General Ferron recommends for the attack the employment side by side of regiments or brigades, whereas, on the defensive, he regards their formation in lines one behind the other as preferable under certain conditions. He does not think that frontal attack offers much prospect of success, even when prepared by artillery fire.

Space does not permit of going further into General Ferron's views, beyond giving a brief extract concerning the decisive attack of an infantry division; but attention is called to the excellent articles on the subject in Nos. 4 and 5 of the "Militär-Wochenblatt" for 1892. He says: "The object of the infantry fight is to obtain the superiority of fire in a position situated at a distance from the enemy of 800 to 400 m. Deep formations must now be avoided, the front sufficiently extended, and resort had, above all, to outflanking manœuvres. All the arrangements must be made for the men to be amply supplied with ammunition. The turned flank of the enemy must succumb to a hail of bullets and projectiles.

"The deployment of the shooting line belonging to the battalions in first line takes place, if in view of the enemy, at about 2,000 m. distance from them; when the supports enter this zone they also form like the shooting line. The companies that are kept back follow the shooting line at from 400 to 500 m. All make use of the shelter available to take breath. Volley firing can be begun at 1,200 to 1,500 m., provided the object to be fired at offers a good target; but the forward movement must be continued until a favourable firing position is reached, distant 800 to 400 m. from the enemy. In this position the firing line will be reinforced by the supports, and extended by the reserve companies. The fire must be intensified to the greatest possible degree.

"At this stage it is not a question of avoiding losses, but rather of inflicting them on the enemy. A large quantity of shots must be fired, so as to gain in all circumstances a superiority of fire, and thus make a continuation of the advance possible. Of two opposing lines of infantry victory will rest with that one in which the men can handle their arms the most skilfully and have the most cartridges.

"If the enemy is kept under by the converging fire of frontal and flank attack, the assault will be undertaken, but not by the shooting line. The latter will be too much exhausted and too much weakened by the enemy's fire to be able to cross the distance of approximately 600 m. that separates it from the enemy, and overthrow them. The assault must be carried out by fresh troops, not yet weakened by having been engaged, and in close order. The firing line of the neighbouring battalions join these troops.

"As soon as the leading companies come up with the shooting line these advance with them and fill up the space between the individual battalions. The entire mass then advances 200 m., takes breath, and endeavours to overcome by its fire the last resistance of the enemy. After a few minutes the battalions rise up, the companies in rear

take the place of the most advanced ones that have been disordered by the fire, and advance again until the enemy's position is gained."

The care which France is taking to be prepared for a great war is evidenced, amongst other measures, by the exercising of troops for the protection of the railways. It is the troops of the Territorial Army that are to watch the lines during mobilization.

Russia.—In the new musketry regulations figure targets only are recognized. The men shoot only in formation as a firing line, and firing takes place up to 2,200 m. The targets are 1·78 m. high, and a number of figures, body, or head targets can be pasted on them. Excepting for recruits, there is generally no firing under 200 paces; individual firing is practised up to 800 paces, and volleys at longer ranges. Judging distance is diligently practised, and an endeavour made to instruct infantry to judge correctly up to 2,500 paces.

New instructions issued for the attack prescribe the deployment of the infantry employed into fighting formation at a distance of 1,400 to 2,100 m., according to circumstances. After the enemy has been thoroughly shaken by artillery fire, the infantry advances to within 550 to 700 m. of the enemy and then halts. The firing line has to look out for an appropriate firing position; the artillery accompanies the infantry to about 850 m. of the enemy, as far as possible on the flank of the troops for the assault. The shooting line is then advanced without any pause to 100 m. or 200 m. from the enemy. Here rapid fire is opened and then, when the reserves reach the shooting line, the assault is delivered.

A peculiarity of the Russian Army are the winter exercises carried out in Petersburg, Warsaw, and the Caucasus with and without ball ammunition. The experiments against intrenchments, constructed of loose and beaten snow, were of considerable interest. The penetration effected in loose snow was the following: at a distance of 600 m. it was from 1·2 to 1·3 m.; at 300 m. 1·2 to 1·4 m.; at 150 m., 1·5 to 1·75 m.; at 75 m., 2·3 to 2·4 m. In beaten snow the results were still more favourable.

In the Krasnoe Selo camp a number of night exercises took place in 1891, at which the value of the specially trained hunting detachments was clearly demonstrated. The troops accustomed themselves remarkably to the difficulties offered by a dark night and learned to reconnoitre the ground by night.

In Russia a special partiality exists for the so-called penetrating attacks. Their object is to accustom the infantry to the powerful impression of a large mass of cavalry sweeping down on them. At first the cavalry rides at a walk through the infantry lines so that the men may become accustomed to the appearance of the horses. An attack at full gallop follows equally through the middle of the infantry. Whether these exercises are really of use we will leave undecided. In the first place one might think that the intensity of the firing may be a useful exercise for the horses. The German infantry in 1870 exhibited no trace of uneasiness in face of the French cavalry attacks; in Germany, therefore, penetrating attacks would seem to be quite superfluous.

Switzerland.—The new drill book for the Swiss infantry is the expression of the general opinion regarding the present state of infantry tactics, only made to suit the peculiar conditions of Swiss military service. It is, therefore, worth while to consider these regulations more closely.

The company is divided into 4 subdivisions and into 2 "plotons;" every 4 files form a group. The firing is conducted by the company or the subdivision leader respectively, who must be provided with field glasses. There are not to be any volleys, only individual and magazine fire. Distances up to 500 m. are classed as "short;" from 500 to 1,000 m. are "medium;" from 1,000 to 2,000 m. "long."

To form the advanced shooting line entire subdivisions are always extended; battle patrols must never be forgotten. The remainder of the company follows as support in line, in open line of subdivisions, or in one rank. Column is only to be employed when complete cover is available. The reinforcement of the extended line is carried out either by prolonging or by strengthening it.

The company assembles either in column of "plotons" or of subdivisions. The normal formation of the battalion is either "plotons" column or line of columns, only exceptionally in subdivision column. In plotons column the companies stand in plotons column one behind the other; in line of columns they are in the same formation, side by side. The intervals and the distances are each 6 paces. The conversion from one formation into another is always to be executed by the shortest way. In fighting formation there is a shooting line and the battalion reserve; the latter follows at first at 400 m. distance, and subsequently according to circumstances.

It is the same with the regiment, which, as a rule, consists of 3 battalions; also with the brigade. The deployment of a regiment into fighting formation takes place with a small front and deep distribution. A battalion of direction is always to be given, and the general direction of the attack fixed. The rearward lines have at first a distance of from 300 to 500 m., but they depend afterwards entirely on the circumstances of the fighting and on the ground.

In the fight decisive importance is frankly attributed to fire, and extended order is indicated as almost exclusively the fighting formation. Whenever it is possible every fight is to be conducted by means of the offensive, for the attack alone leads to decisive results. A decided clear resolution is to be taken by the Officer in command, and is then to be executed with iron will. Irresolution is indicated as a gross fault; but inaction as punishable. Orders are to be simple and clear, and their execution is to be carefully watched. Under all circumstances the necessary scope is to be afforded to subordinates. The communication to them by the Commander of his own views before the fight is stated to be specially desirable. During the advance the Commander should always be in the front, so as to see for himself and receive reports early. During the engagement, on the contrary, he should remain with the reserve, because, once the fight has commenced, he can only exercise a decisive influence on its course by the proper employment of the reserve.

In the sphere of effective fire mounted Officers of infantry are to dismount even in peace. All the Officers also are to make use of cover in peace, so that the troops may be accustomed to seeing this done. This appears to us very important.

Few men should be deployed in the shooting line until a clear view is gained; then strong swarms of men should join it, so that a superiority of fire may be obtained as quickly as possible. The front is always to be kept small, so that the firing line may remain thick. A single company must never occupy a front exceeding 100 m.; care is to be taken to have a proper distribution in depth.

Closed bodies retained in rear are best placed in échelon behind a flank of the fighting line, that they may avoid useless losses. They should only be kept in column when under cover.

A brigade is to occupy a front of 1 km. Within 1,500 m. when exposed to effective fire the advance is to be in rank entire. Flank movements under fire are distinctly forbidden. In the attack a point to march on is to be selected as far off as possible. Up to about 600 m. the advance is to be in quick time, from thence by rushes.

At a greater distance than 1,000 m. fire is only to be conducted by bodies of at least the strength of a subdivision, and then only when there is a prospect of favourable results. The zone of greatest fire-effect begins at 500 m. Here, therefore, the principal firing position is to be taken up. But as a last act before breaking into the hostile position, a magazine firing position is to be taken up at fixed sight distance.

The regulations say that infantry fire first becomes superior to artillery at 1,000 m. Flanking fire is always to be preferred to frontal fire. Pauses are to be made in the firing, always at least with a subdivision front; the signal will be a long shrill whistle. The ammunition wagons follow their battalions into action up to within about 1,500 m. distance behind the centre of the brigade for the 1st relay, and 2,500 m. for the 2nd relay.

The unprotected wing has always to provide for the flank defence. The assault is only to take place when the enemy are shaken by artillery fire. A turning movement should be directed as nearly perpendicular as possible against the enemy's flank.

The impulse for the assault originates either with the shooting line or with the Commander, who sees everything, which is better. It is certain death to retire exposed to the enemy's fire. In the assault the advance is only to be continued sufficiently far to secure a free field of fire on the retiring enemy.

In the defence the chief point is a careful choice of position; great pains should be taken to strengthen the ground artificially. The occupation of advanced posts should as far as possible be avoided. A strong front of fire is of more importance. Its complete occupation, however, should not be carried out until the direction of the enemy's attack is known. The supports for the firing line must be placed as near to it as possible. The ground in front should be paced and the distances made known. The flanks are to be covered

by battle patrols. A main reserve is always to be set apart, for the counter-attack is the main point in the defence; but it must never be undertaken with the firing line.

Speaking generally, nothing but complete approbation is to be accorded to these principles of the Swiss drill regulations; they are in complete accord with the characteristics of the Swiss troops and with the conditions of tactics at the present time.

Literature.—The more important works of a tactical nature published during 1891 were the following:—

i. "Betrachtungen über eine zeitgemässe Fechtweise der Infanterie." Von Bronsart v. Schellendorff, Commandirende General. Berlin, 1891.

ii. "Reglementarische Studien." Von v. Scherff, General der Infanterie z.D. Berlin, 1891.

iii. "Die Nothwendigkeit der zweijährigen Dienstzeit." Von v. Boguslawski, General-Lieutenant, z.D. Berlin, 1891.

iv. "Quelques indications pour le Combat." Par le Général Ferron. Paris, 1891.

v. "Meldereiter bei der Fusstruppe." Von Regenspursky, Oberstlieutenant. Wien, 1891.

vi. "Mehr Feuer beim Angriff." Von K. v. K. Berlin, 1891.

Cavalry Tactics.

Opinions respecting smokeless powder have, at least in the circles to be regarded, declared themselves still more in the sense that it has not introduced a new era for cavalry. "I imagine that everything continues for us as of old, whether with or without smoke and noise," says Major v. Kleist, in his excellent pamphlet on Officers' patrols, the best, indeed, that has been written on this latter subject. As a logical consequence of the introduction of the new means of propulsion, it must be recognized that the chief characteristics are not the freedom from smoke and noise of the new powder, but rather the increased range, flat trajectory, and precision of the modern arm. As regards the performances of this, especially of the Lebel rifle, experiments at the Châlons School of Musketry have shown that 16 or 17 shots are required to place *hors de combat* a mounted man halted at 600 m. distance, a number of rounds that would have to be considerably increased if the horse were moving at a gallop.

From this it may be rightly concluded that the chances for the scout are still very favourable, leaving out of consideration the fact that it would be hardly necessary, especially if he were provided with glasses, to ride up so close and without cover. The French, though not those in cavalry circles, are wrong in their pessimist apprehensions. An instruction issued by the Technical Committee for the Infantry runs as follows: "In general the cavalry can ascertain only 'sommairement,' and not with precision, the position, strength, and dispositions of the enemy. The insufficiency of the cavalry must, therefore, be supplemented, 'en faisant appel aux autres armes.'"

In the directions for the last great manœuvres there was an instruction in the same sense, to the effect that as soon as the enemy was approached the cavalry was to clear the front and be replaced by infantry groups, which would then take over the scouting duties.

The pamphlet referred to above continues as follows: "To banish cavalry from the battlefield because an improved rifle has been invented, is to view the events of the day as of supernatural size and not in the light of the century, then let us enter merrily into the age of smokeless wars! This time, again, the repast will not be so hot as is now cooking in some pots and perhaps, also, in some people's heads." In this reference, also, Major v. Kleist is completely justified. Every cavalry man will agree with him and none will be kept back by black prophets from doing his duty on the battlefield.

Cavalry will not ride at more or less intact infantry; that it has never done with success, but their opportunity will be where only a weak fire may be expected, as on the flanks, against battalions retiring physically or morally shattered, which have fired all their ammunition. The factors that influence their success, the bearing of the enemy's infantry and the degree of surprise with which the attack is made, lie outside the question of arms.

The well-known Russian General Suchotin expressed as his views that the difficulty at the present time in the employment of cavalry on the battlefield must not lead to their utility being altogether denied, but rather to these difficulties being overcome by means of better instruction. In earlier days the cavalry have profited by some of the conditions of modern war, especially the murderous fire that shakes the enemy's nerves and depresses their spirit. "The entire peace training of cavalry has one object only in view, in the moment of danger to sweep down like a hurricane on the enemy, especially on the most important portion of them, which is the infantry."

The well-known Austrian Colonel v. Walthoffen expresses himself in exactly the same sense. In the "International Review" he has published a very learned and exhaustive paper on the subject. He divides the modern battle into five phases. Already, in the first phase, the introductory, the careless advance of the enemy's advanced guard, or the too late retirement of their outposts, offer favourable opportunities to the cavalry for a sudden stroke. He does not consider it possible for the cavalry to come forward during the execution of the actual infantry engagement on account of the enormous power of the present rifle. It should, therefore, be withdrawn behind the flanks or centre. In the critical moment, when the attackers proceed to the actual attack, and the defence endeavours to meet them, the cavalry can be employed, though with care, to bring the enemy's attack to a stand and force them to suspend their action. At the decision, that is the assault, or on the defence—the action to repel it, all the forces must be called up, all the arms must co-operate. At the decisive moment one can never be strong enough; just as the last battalion and the last cartridge must be employed, so must also the last cavalry soldier and the last breath of his horse. As regards the pursuit, Scherff's saying is referred to: "Any one who has

seen infantry falling back from a real infantry decision, knows what a rich booty they will be, in spite of the breech-loader, to cavalry falling on them at the right time in masses, and riding them down with one heavy wave following shortly after the other."

Colonel v. Walthoffen lays down the following considerations for the success of a cavalry attack:—

1st. The most complete surprise possible, the ground and weather will often allow of it; the most favourable moment is when the attention of the enemy is distracted, so that they do not observe the approach until too late or not at all, and when the enemy's nerve is shaken, the moment of the Napoleonic "événement."

2nd. Against flanks and rear as the most sensitive points; here lies the decision, not only tactical but also strategical; defeat will mean a catastrophe.

3rd. The greatest possible energy and development of strength, formation in depth, attack on attack, which will not allow the enemy to regain his senses.

4th. Assembly of all the available forces, unity of leading, determined and energetic execution with a knowledge of the object to be attained. Every individual must be impressed with the irresistibility of his attack. Having regard to the result, even considerable losses must not be shunned. Seydlitz, at Zorndorf, lost in one hour 21 per cent. of his cavalry, 78 Officers, and 1,267 men out of a total strength of 7,000. Tactically his task was as hard as it could hardly be at the present time; for the Russian masses stood 12 ranks deep, and the artillery and infantry fire were quite enormous. Colonel v. Walthoffen, moreover, estimates the number of hits during an attack in the present time very low, indeed too low. He believes that cavalry, up to within 600 m., offer a very bad target owing to the rapidity of their movement and the difficulty experienced by their opponents in arranging their sights. But the last 500 m. would be traversed in less than one minute; more than 1 per cent. of hits should not be expected with normal conditions. The considerations conclude with the words: "Now, as in the time of Seydlitz, and always, if only in sufficient strength, and set in motion in a favourable direction at the proper time, with a definite object, and regardless of consequences, cavalry will certainly break upon the surprised enemy like a destructive tidal wave, sweeping everything away that does not get out of the way of its destroying path."

One principal condition stands out from all these considerations: retention of the cavalry in masses, no dispersion and isolated enterprises of weak bodies, as so often was seen in the 1870–71 campaign. With these mass tactics, if we dare say so, the question of cavalry corps again comes to the front. The Russian great manœuvres of 1890 have brought the question forward again, and the for and against each endeavours to prevail.

The considerations against the cavalry corps are that it only brings to bear the individuality of one leader, and that the supply of such large masses at one spot is impossible. Its extent of front is too small, the covering of the broad front of modern armies demands

expansion in different directions and contact with the enemy at the greatest possible number of points. Reports from one point seldom serve to make the situation clear. Further, the Commander of a cavalry corps to whom the divisions on the several roads are subordinated is an unnecessary intermediary, through whom the reports have to be sent out of the way and would come too late; also the Commander cannot possibly overlook the whole of front, and will frequently, therefore, not be with the main body at the spot where its presence is required. The distance from the centre to the flanks, and *vice versâ*, is too great to permit of mutual support. It is not possible to direct on one point, by surprise, 60 or 70 squadrons; the rapidity, mobility, and elasticity, the chief power of cavalry, will be lost. In peace exercises, lastly, this massing of cavalry tends to the neglect of the training in mixed bodies and the working in co-operation of the three arms. It is therefore desirable that the independent divisions should continue to be the unit both for operations and for battle, under the direction of, and immediately subordinated to, the chief Commander. The "Jahrbücher für Deutsche Armee und Marine" instance in support of their opposition to cavalry corps the Napoleonic campaigns, especially those of 1805 and 1806, and seek to show that, though so often successful, the reconnoitring was insufficient. In December, 1806, the incomplete intelligence gained by the closely concentrated cavalry corps commanded by Bessières would have made impossible a decision that would at first have been possible at Pultusk.

We might, on the other hand, recall the great results effected by Napoleon's cavalry corps. For the strategic reconnoitring, however, it appears preferable to adhere to the division as the unit, and not begin by assembling all the available cavalry divisions in corps. Indeed the numerical strength, or rather weakness, would make this course imperative. Germany, for example, after deducting 20 brigades (40 regiments) for her 20 Army Corps, would only have 52 regiments left from which to form corps. Instead of 3 or 4 of these, the formation of 8 or 9 independent divisions, 2 or 3 for each Army, would be more practical. It by no means excludes the employment of cavalry corps. During the operations many situations can be imagined in the different stages of a campaign in which the assembly of several divisions under one command would offer the means of carrying out special definite tasks. And for the battle this must be the rule; for years it has been ordered both by the Austrian and German regulations.

To be in principle against cavalry corps appears to us to be as little right as to form such bodies always and permanently. The military situation should alone decide their formation. Napoleon followed this principle. He always acted according to circumstances, and he never formed cavalry corps only or formed them permanently. Their strength was very varied, often hardly greater than that of German cavalry divisions. The difficulties in moving, leading, and quartering cavalry corps should not be reasons against them: how to overcome these difficulties must be learnt by sufficient practice.

Cavalry Manœuvres.—Some interesting exercises took place in Russia, especially in the Warsaw district and in the Vladikavkas camp. General Gourko, Commanding at Warsaw, was present at an exercise carried out by the 1st and 14th brigades formed in a division against a marked enemy, representing at first cavalry and afterwards a rear-guard of all arms, and also at an exercise of the 6th and 13th Cavalry Divisions, and the 3rd Brigade, 2nd Guards Cavalry Division, formed as a cavalry corps against a supposed enemy retreating.

Gourko, on this occasion, dwelt on the importance of practising the marked enemy from time to time. The best Officers must lead its squadrons; much more instruction is gained thus than by riding before the subdivision. The more skilful and independent the marked enemy, the more instruction will be derived from the exercise. There will then be no grounds for fearing the most skilful enemy.

At the Vladikavkas camp a force of 7 battalions and 23 squadrons (the cavalry in the middle, 6 battalions to the right and 1 battalion to the left) attacked a large battery of 36 guns, supposed to form the centre of an enemy's position, and having a regiment of infantry on either flank. The moment chosen was after the enemy's artillery had been firing for some hours, and the infantry had come up into the firing line in its support. The cavalry attacked the batteries in front, the 7 battalions were directed on the infantry opposed to them, so as to draw off their fire from the cavalry. The latter started at a distance of 5,000 m. from the guns; during the advance both pace and formation were frequently changed, so as to hinder the fire of the guns from taking effect; the attack was executed at all the paces up to the shock; the charge was carried out by means of half-squadrons extended in swarms, followed by the closed bodies. The former surrounded the guns on all sides, the latter passed through the intervals, and fell on the escort and then the infantry. The attack was executed, in spite of the hottest fire, with quietness and energy.

The observations made by the director of the French Cavalry Manœuvres held at Châlons were published in the December number (1891) of the "Revue de Cavallerie." The following are amongst the more important points adverted to:—In the exercises of one regiment against another, the reports of the advanced guard were generally waited for, which is wrong. The advance should be made, the reports are then received quicker, and the possibility of effecting a surprise is greater. The object of the advanced guard is not to obtain intelligence from a distance in front, but rather to secure the main body from surprise.

When the enemy were encountered it often happened that single squadrons were detached to operate against a small portion of the enemy, and resulted in a want of unity in the fight; portions of the enemy that separate themselves from the main body are of secondary account; the important point is to overthrow the main body. The flank squadrons did not always carry out their *rôle* satisfactorily; there were often large intervals between them and the flank of the principal line that had to be protected, so that the enemy could have pushed through and got round the flank in spite of them. The retention of reserves

was not always observed, or when it was they entered the fight at the same time as the principal attacking line.

In the exercises of brigade against brigade it was observed that the leaders often clung closely to their troops, and consequently lost view of what was passing. A whole brigade of three regiments engaged in this way three squdrons. It was no excuse that this was due to want of intelligence; no leader ought to engage without having seen with his own eyes. The artillery escort has not always fulfilled its duty; it must reconnoitre the ground about the batteries, and thus protect them from surprise. The assembly after the mêlée is best in rear with the reserve not on the actual ground. It took place frequently in column; by regulation it should be in line.

All Officers' patrols ought to receive their instructions personally from the Divisional Commander. The subdivisions sent forward to reconnoitre should not be altogether extended, as is often done, but they should be kept in close order, and only small patrols consisting of two or three men sent out from them. The strength of advanced guards differs very much; it may be quite right one time to send a whole brigade, and at another two squadrons will suffice. Battle patrols only report verbally, they have not time to furnish written reports. Attacks upon batteries should generally be made on a flank: they were frequently frontal when a flank attack was possible. On one occasion the reserve had been drawn into the fight, and had taken its place on the extreme left flank, when actually required on the right. It must be kept far from the fight, and so placed as to be prepared for all eventualities.

Use of the Carbine by Cavalry.—From time to time, but without gaining in influence, the view is advanced that the employment of cavalry dismounted, and of the fire power of the carbine should be extended. The most advanced ideas on the subject lately published are contained in "Unsere Cavallerie" (Hanover, 1891, Hellwing). "As in a battle, so also in the fight of a cavalry division, every gun, every carbine, and every rider must be made the most of," and, further, "We must place a greater value on the utilization of the fire power of our cavalry divisions, and it is more natural and corresponds better with the perfection of our modern fire-arms to shoot an enemy than to ride him down or run him through." These are the views of the author, and to give effect to them he would form the whole of the cavalry in rank entire. The advantages he claims for this formation are that it allows of more rapid deployment, because in the attack the rear rank is not brought to bear, because it facilitates more extensive distribution from front to rear, and, lastly, because only by means of it is it possible to dismount quickly and maintain a continuous fire action.

Captain Choppin, of the French Army, pronounces himself against such theories in the following words, which are very much to the point: "Everything that can be done mounted must be done mounted." In other armies the same view is taken, and lately an instruction has been issued by the Russian Inspector-General, directing that the practice of fighting on foot is only to be resorted to in

those cases in which it would really be used in war, and a warning is given against its excessive employment. Fighting dismounted is and will continue to be a makeshift.

All true cavalrymen must be strongly interested in the question of firing mounted, that has lately been hotly discussed in Russia, which is the more strange from the author being General Suchotin, a generally acknowledged cavalry authority. He speaks of the undoubted guarantees for this kind of fighting from the Napoleonic wars and the American War of Secession, and notices the fact that in the Russo-Turkish War of 1877–78, a lancer regiment fired 40,000 rounds mounted; with what result is not stated. He considers, too, that now the conditions are more favourable for it than they were formerly, when fire could only be used at distances that could be covered in a few strides at the gallop, and was consequently ineffective. The man shooting from horseback has further an advantage over the infantry soldier on account of his greater elevation and consequent extended field of view.

But it is not against infantry but against the enemy's cavalry that he looks for its employment by a weaker force or against an enemy who withdraws from fighting in the open into broken, marshy, or wooded ground. Three or four volleys would be delivered at distances from 1,800 to 400 m., and at the last moment the cavalry will be launched with drawn swords on the enemy. Firing at the enemy in front and changing on his flank, and *vice versâ*, are specially recommended. Systematic training will lead to the cavalry shooting as well from horseback as the infantry shoot. The author of "Unsere Cavallerie," already referred to, accepts this manner of fighting as already adopted by the Russian cavalry, and thinks it very likely that in a future campaign we shall find Russian squadrons advance at the trot, halt at 500 m., fire a volley, and then straightway charge at the gallop with fixed swords. He is further an enthusiastic adherent for this mode of combat; but if he expects great results from the volleys fired, the Russian cavalry have already proved the contrary. Half a sotnia of Daghestan Cossacks (men accustomed to horses and rifles from their youth), after firing some volleys with blank at the camp of Torni-Chan-Schura, delivered two volleys with ball at targets situated at 800 m. and 600 m. distance. The result was four hits to 60 rounds, and none to 52 rounds respectively.

Corps or Divisional Cavalry.—The comparatively weak strength of the cavalry and the constant and proper endeavour to mass it have contributed greatly to the value of corps or divisional cavalry being underrated. The reports of the Russian and French manœuvres contain frequent complaints of this. It has been imagined that, in the present age of the employment of enormous masses in war, divisions and corps would play a secondary *rôle*, and that single Army Corps would no longer march against an enemy, but only armies of five or six corps; consequently, the cavalry should be taken from the Corps Commander and placed together under the orders of the General in chief command. In the endeavour to form the greatest possible number of cavalry divisions, it is often deemed sufficient to

provide the infantry with a few orderlies, as far as possible mounted on horses called up on mobilization.

Russia, for example, has formed almost her whole cavalry into independent cavalry divisions (twenty). Only twenty-four sotnias are available as corps cavalry, which, in the course of mobilization, would be strengthened by the Cossacks of the 1st and 2nd levies. But the latter could hardly be depended on at the commencement of operations. But such views are a misappreciation of the actual conditions. Undoubtedly both species, the cavalry divisions and the corps cavalry, have their full justification. The operations and strategic measures to be adopted will depend on the reports of the former, the tactical measures on those of the latter. The war of 1870–71 offers a number of examples of the divisional cavalry making important reports which had not been sent in by the cavalry divisions. A number of corps belonging to an army never march close together, but on different roads, often separated some distance from one another, in an enemy's country, perhaps in a country the inhabitants of which have risen. The connection of these columns with one another can only be maintained intact by means of cavalry. The cavalry divisions are often more than a day's march in advance and are not in a position to undertake the indispensable duties of immediate security. The German "Felddienst-Ordnung" says: "Cavalry divisions or portions of them in front of the army are, having regard to their special tasks, not generally in a position to cover immediately the portions of the army that are following. These must, therefore, even if they have cavalry divisions in front of them, always tell off an advanced guard. It is the duty of this latter to obtain and keep up communication with the advanced cavalry divisions, by means of its cavalry."

And, lastly, without cavalry the corps ceases to be a strategic unit; in the absence of direct reports the Commander cannot possibly have the time to make his decisions and dispositions. Napoleon always had his cavalry divided into two parts, independent divisions or corps, and the regiments attached to the individual infantry corps; the strength of the latter was not fixed and unchangeable, but it depended on the strength of the corps—which differed considerably—the service to be performed by it, and its greater or less independence. In the 1805 campaign, for instance, there were 112 squadrons assembled in cavalry divisions and 93 squadrons distributed between the 7 separate corps (7 to 16 squadrons per corps). In 1806 the proportion was 114 and 61; in 1809 it was 97 and 37 (7 to 18 per corps). The corps on the flanks were made particularly strong in cavalry. The campaign of 1806 offers, also, a very clear example of the necessity for having corps cavalry. The cavalry was withdrawn from Bernadotte's corps and the regiments allotted to the reserve cavalry. Bernadotte, who had in his front Bessières with 2 cavalry divisions and 3 light cavalry regiments, feeling his helplessness, asked that his regiments might be given back to him at once, "for it is of the greatest importance that every corps should have cavalry, even when there is cavalry in its front." He was very nearly being surprised.

The number of squadrons to be employed with each corps as divisional cavalry should not be greater than is required to perform efficiently the duties they will be called on to do. Both in Germany and in France it has been fixed at a brigade of eight squadrons. In view of a pitched battle it will generally be practicable to unite the cavalry of the several corps temporarily.

The necessity for an increase to be made to the cavalry is gradually gaining ground. The important new formations of the last few years have almost all been to the benefit of the infantry and artillery. The old proportion between infantry and cavalry has, even in peace, gone back from 4 : 1 to 10 : 1, and in war, on account of the enormous reserve formations of infantry, it will sink as low as 20 to 1. And at the same time the demands on the cavalry have constantly risen. The sphere of their activity, that is their own front to be covered and the enemy's front to be explored, has materially increased in extent. The magazine rifle would soon reduce the existing insufficient number still more, and it will then be hardly possible to obtain the necessary men to complete their strength, for the cavalry is the least suited arm for reserve formations. In consideration of all these points, the several States are now commencing slowly to increase the numbers of their cavalries. Russia has raised a new 15th Cavalry Division, provisionally of three regiments only (47th and 48th Dragoons and 3rd Ural Cossacks). The fourth dragoon regiment which is wanting will, no doubt, be created before long, and to all appearance this division is only the beginning of further new formations. Russia has now 20 cavalry divisions (2 Guards, 15 Line, 1 combined Cossacks, 1 Caucasus, 1 Don Cossacks of 4 regiments, each of 6 squadrons) and 24 sotnias of corps cavalry, to which in war the 1st and 2nd Cossack levies would be added. Austria-Hungary has raised a new 15th Dragoon Regiment. The "Reichswehr" says this by no means suffices, for in a future campaign there would be 782 squadrons opposed to 341 at the disposal of Austria. France, under the authority of the laws of 1887 and 1890, has raised the 30th Dragoons, 13th Cuirassiers, and 13th Hussars, so that she now has 87 regiments, of which 10 are in Algiers and Tunis, and must consequently not be reckoned in the first line.

Night Operations.—These are beginning gradually to become naturalized, but, as yet, not to an extent proportionate to the importance of the subject. They have for years past formed a part of the exercises of the Russian Army, and have now been introduced into France and Italy. During the last French great manœuvres an exercise of this nature was held, and frequent ones at the Italian camp of Caserta.

Magazine Carbine.—This arm has been introduced into the cavalry in Germany, France, Austria, and Belgium.

Exercises in Swimming.—Draft swimming instructions have been issued to the German cavalry. The saying of General Gourko, "Canals and rivers are no longer obstacles to the cavalry," must not be so unconditionally accepted. In the practical trials many difficulties have arisen which at first were not encountered; swimming over

rivers in this way without preparations is not generally feasible. The draft of the German swimming regulations also dwells on this. "If the horses are not in a condition to carry their riders for a considerable distance," it then follows from this that "a stream of some depth and breadth cannot be crossed by a formed body of cavalry without the help of boats."

The "Revue de Cavallerie" arrives at the same conclusions in its paper contained in its September number (1891), "Passage des Rivières." It treats of the three methods—the rider in the saddle (Skobeleff); swimming by the side of the unsaddled horse, saddle, arms, &c., on rafts or boats; and swimming by detachments behind a boat, the men, saddles, and arms in the boat. The latter method is held to be the safest and most desirable. "But in any case an endeavour should be made to have in every squadron some patrols which, lightly armed and provided with light equipment, can swim broad streams without assistance and be able to ride on without delay on the other side." Certainly that must be attempted and, under any circumstances, steps taken to ensure that unimportant watercourses, which often have only a few feet of the depth for swimming, shall cease to be obstacles, and to cause a detour to be made, as is now often the case. Repeated exercises will remove timidity both from horse and man.

Tactics of Field Artillery.

The views regarding the importance of smokeless powder in war generally and its employment by field artillery in particular have been cleared up and have resulted in a settled conclusion. Whether it be true or false can only be decided by the next war. In all armies its consequences are now being taken into consideration in the instructions for fighting and the regulations, &c., which had previously not been done at all, or only in a small degree.

During the course of 1891, smokeless powder was introduced for the field artillery in all armies excepting in that of Russia. It is to be observed that whereas all the artilleries, the French and German at the head of them, were, on the introduction of the new powder, satisfied with the performances of their guns, the Austrian field artillery have, according to the "Reichswehr," raised the initial velocity of the projectile fired by their 9-cm. gun from 448 to 480 m. This apparently is connected with the fact that Austria was at the time on the point of introducing a new shrapnel fuze arrangement to extend the sphere of effect of shrapnel. They had, therefore, a free hand and were able to utilize the characteristic of the new powder—that it strains less the barrel and carriage—by increasing the initial velocity to the point at which the strain to the barrel and carriage would equal that exercised by the old powder. But the importance of a certain increased initial velocity must not be over-estimated; the gain will be only a somewhat flatter trajectory, and, as result of this, greater depth of burst and an increased range of about 200 m.

In former reports the opinion has been expressed that one result of

the introduction of smokeless powder would be the increase of field artillery, which has derived the greatest benefits from it. It was thought that both France and Germany would have increased their artillery. In Austria-Hungary it has actually been done. The corps artillery, which had consisted previously of 5 batteries (40 guns), has been increased by one battery. Besides this the number of batteries on a diminished peace establishment as centres for new formations have been increased by 15, so that each corps now has 3 of them, and in Austria-Hungary cadres are maintained for the ammunition columns and Ersatz batteries; consequently, on mobilization, the field batteries do not have to furnish detachments to any appreciable extent. A further strengthening of the artillery has been effected by substituting heavy guns for the light ones in all field batteries. It is the intention also to arm the horse artillery with the 9-cm. gun, when the pattern will be identical throughout.

In Italy the 7- and 9-cm. batteries used to be included in the same division. In October, 1891, it was ordered that in future the corps artillery is to be composed of 1 division of 4·7-cm. and 1 of 4·9-cm. batteries. Thus, in Italy, the division has become the tactical unit.

It has been everywhere admitted that the value of skill in shooting has been materially increased owing to smokeless powder. In 1890 the Field Artillery Practice School in Germany was much enlarged, and the number of Officers to be trained there annually was doubled; and now, again, a great change is being effected in this school. For the coming year a further increase is contemplated of the instructional Staff, the necessity for which is based on the provision that in future every young Officer is to undergo a four months' course at the school. We receive this innovation with satisfaction, and look for great profits from it. But we regard somewhat differently the abandonment of the Artillery School for the Officers of the field artillery, and we fear that the short period of these Officers' stay at the practice school will not suffice for adequate scientific instruction. In our opinion not only is such instruction necessary for Officers of the foot artillery, but also for those of the field and horse artillery to enable them fully to understand the practice. Theory and practice are by no means in irreconcilable opposition.

The artilleries of all the greater States attribute a constantly increasing importance to good shooting. Following the example of Germany, practice schools have everywhere sprung into existence for the training of artillery Officers; in France and Russia they have existed for a long time; in Italy the practice school established in 1888 was enlarged in 1890. In Austria-Hungary alone the necessary measures have not been taken for training the Officers in firing. A course of practice, lasting 3 weeks only, and in which only Senior Captains awaiting their promotion to Field Officers' rank participate, does not by any means satisfy the requirements of the present day.

In France a practice association of Officers of the Territorial Army has been formed at Paris with a view to encourage skill in shooting; Officers of the Active Army and of the Reserve can belong to it also.

The firing takes place on the Vincennes exercise ground with guns of small calibre and reduced charges at a distance of from 300 to 400 m.

Last year we dwelt upon the necessity for introducing an improved telescope which, by means of its increased power and sufficient size, would cover a large field of sight. At the great distances at which the artillery fight will be carried out in the future it will not be possible to observe the shots without an instrument of this nature. According to the "Reichswehr" each division of the Austrian field artillery has lately been provided with a large tripod telescope, which is carried by a mounted man.

It is generally recognized that smokeless power demands a thorough utilization of ground, so that fire may be opened unsuspected by the enemy and the discovery by the enemy of the position of the guns firing on them may be rendered more difficult.

The selection and examination of the position, and especially the operation of moving up into it, must be conducted as far as possible under cover, for otherwise the position will be detected before fire is opened. If, through an openly conducted examination of the position and an unsheltered advance into it, the position is betrayed to the enemy before fire is opened, half the advantage of smokeless powder is sacrificed. The examination of the proper position and of the approaches to it is now more important than ever, for a mistake made in regard to them is more heavily punished, and can hardly be rectified at all. The recognition of these conditions led this year to three days' exercise in varied ground being ordered for the whole of the German field artillery before the commencement of the autumn manœuvres. We regard this as a rule of great importance. At the manœuvres themselves time generally presses, and hence the danger either of neglecting to take up positions under cover—the most frequent fault—or from want of skill of losing too much time with the reconnaissance of the position and the sheltered approach to it. Useful experiences will therefore not be gained on the manœuvre ground alone. On the other hand, the great utility of the exercises referred to is quite uncontested; the employment of the artillery under service conditions will gain enormously by them, and the more so in proportion to the size of the bodies engaged in these exercises. A commencement should perhaps be made with the artillery division, especially in those garrisons in which suitable ground is not available; but they should also be held by regiments, and even perhaps in still larger bodies. The difficulties increase with the largeness of the formations exercised under service conditions. Even a right judgment as to the space required for the deployment of a large mass of artillery is only to be learnt by means of practice, as well as the discovery of covered ways of approach, the issue and communication of orders, the choice of a covered preparatory position, and, lastly, the advance from this position and deployment to the proper front.

After having, during the last two years, occupied the place of chief interest, the literature on the question of smokeless powder has now

come nearly to an end. We have only two French papers on the subject to mention: "Rôle et emploi de l'artillerie avec la poudre sans fumée," in the March number of the "Journal des Sciences Militaires," and "Modifications à apporter à la tactique de l'artillerie par suite de l'emploi de la poudre sans fumée," by Le Colonel d'Artillerie Marsillon, in the June number of the "Revue d'Artillerie." In both papers it is recorded that the French powder makes no smoke, and this facilitates observation and the service of the guns, but that, on the other hand, a very considerable flash is to be seen at each round, estimated at from 4 to 7 m. in diameter. Both are agreed that, in order to avoid betraying the position of the guns to the enemy, they should be placed behind a screen from 3 to 6 m. high. The conclusion drawn from this, however, by the two writers is entirely different. The "Journal des Sciences" desires a completely covered artillery position with tightly closed intervals. It would, as a rule, employ indirect fire; the Captain should direct the fire from an elevated point, for which rules have been drafted. An artillery engagement, such as, according to modern views, opens every battle, would naturally no longer take place. Unfortunately the rules do not provide for the contingency of the enemy changing his cover.

In our opinion the "Revue d'Artillerie" has adopted a sounder view. Exactly as in last year's report we pronounced against the exaggerated passion for firing from covered positions, so also does Colonel Marsillon. He declares those to be the best positions from which the object can be seen clear over the sights; positions from which the sights cannot be laid on the object are only serviceable if the battery Commander can observe it from horseback or from a point close to the battery, and so unite the direction of the fire with observation. All positions that aim at securing still greater cover he holds to be altogether unfitted for field service. Entirely our opinion. The old artillery adage must always be remembered: first effect, then cover, or, as Colonel Marsillon says, "Avant tout voir et autant que possible ne pas être vu." But if he rejects covered positions, he insists the more on the necessity for remaining concealed until fire is opened, and to this end he wishes to see a reduction in the number of mounted people who, by the French Regulations, accompany in too great numbers the Commander of all formations down to the battery. As it is easier to come into action by surprise the greater the distance from the enemy, the artillery engagement will probably be fought at a longer range than before, perhaps at about 3,000 m., because up to this distance the effect of the guns is amply sufficient. The necessity for guns firing over their own troops is gone into very closely, and it is pointed out that the infantry may confidently approach to 500 m. distance from the point fired at by their artillery, provided that the artillery engagement is being carried out at about 3,000 m. and the ranging is completed.

A change of position in order to complete the artillery engagement at a closer range is held to be unnecessary and impossible; unnecessary for the distance of 3,000 m. admits of a decisive effect being

produced; impossible because the movement into the second position cannot take place without it being observed by the enemy. In this matter we hold other views; so general a rule is always false. If, in the first position, a certain superiority, though not a decisive one, has been obtained, there should be no hesitation in going forward in order to complete the success. If this advance be executed in échelon it will undoubtedly succeed, for the batteries remaining in position will take care to draw the enemy's attention to themselves. If one were to be contented to bring about the decision from the first position this might possibly take a long time, and the infantry attack would have to be unnecessarily postponed. Even if the effects of the gun at 3,000 m. should, if it be properly laid, be more than sufficient, looking to its great accuracy, still it is to be remarked that the ranging becomes more difficult in proportion as the object is further away. The shorter the range the easier the observation and therefore also the ranging. Further errors in ranging lose their importance at short ranges, because in these the depth of the burst of shrapnel is particularly great. Consequently everything is in favour of seeking the decision at a shorter distance provided other conditions are favourable.

To prepare the attack, a portion of the artillery should advance to about 1,500 m. of the enemy's position, and bring as powerful a fire as possible on the points to be assaulted. For this purpose, a zone of 100, or at most 200 m. in breadth, should be allotted to each battery, which will bombard it with the hottest possible quick fire, 10 shots in the minute, for about half an hour. We cannot, however, think that such quick fire would be of great use, and will give our views about this later.

During the assault the artillery should assist the infantry with their fire, but without advancing their guns, an axiom which is undoubtedly correct with smokeless powder, when every movement must be immediately detected. A battery which should attempt to unlimber in face of hostile infantry at distances under 1,500 m. would sacrifice itself quite uselessly, and make just the opposite impression on its own infantry to that contemplated. Only after the capture of the enemy's position should the artillery think of advancing for the purpose of securing the position against hostile counter-attacks.

Colonel Marsillon proposes that the horse artillery should be armed with small-bore guns, with very flat trajectory, so as to be able to dispense with ranging when preparing for the cavalry attack, when time is wanting. It appears as if experiments to this end are being made in France; for the hope is expressed that the batteries attached to the cavalry may soon be in possession of such an arm. According to our view, horse artillery is attached to cavalry less with the object of preparing for the cavalry attack than for the support of that arm when carrying out its duties in screening the front of the army, that is to strengthen its powers of resistance. To arm the batteries with quick-firing guns of small calibre would incapacitate them from carrying on an engagement with normally armed artillery,

and consequently a weakening of the horse artillery will ensue. As quick-firing guns are not suited to general purposes, Colonel Marsillon wants one of the three batteries to have guns from which melinite shells could be fired, in order to produce an effect on objects capable of resistance.

The literature of the past year has frequently dealt with the question of the distribution of the artillery with an Army Corps, especially the abolition or retention of the corps artillery.

This question is considered very thoroughly in connection with the history of the 1870–71 Campaign in the "Revue Internationale" (June to September numbers, 1891), in a paper entitled "The Distribution of the Field Artillery within the Army Corps." The writer follows it through all the phases of battle, and comes to the conclusion that the dissolution of the corps artillery would result in advantages only, and lead to no disadvantages, so far as the battle itself is concerned, and further that the removal of an administrative unit with all its services would facilitate the arrangements for marching, quartering, and supply. In his opinion horse artillery is required with the cavalry divisions, but not with the corps artillery. He proposes, therefore, to place each of the field artillery regiments with a division in peace; "means would then certainly be found for arranging during peace the position of the Artillery Brigade Commander with regard to the Commanders of the two divisions." Much as we desire to see the field artillery placed under the divisions, for we should regard this step as the completion of the new order introduced by the abolition of the general inspection, still we cannot agree to a proposal which would inevitably lead to continual conflicts in regard to jurisdiction, and must end in the Brigade Commander being placed altogether on one side. We consider the best solution of the question to be the allotment to each division of a field artillery brigade. Such a brigade would consist of 10 batteries and 5 ammunition columns, a force the strength of which would be suitable for a General's command.

In opposition to this view a writer in the "Jahrbücher für die Deutsche Armee und Marine" (July number, 1891, "Divisions-, Corps-, Armee-Artillerie,") seeks to prove the advantages of a separately organized corps artillery. The unknown writer bases his argument on a statement made in a paper in the "Militär Wochenblatt" (Nos. 44 and 45, 1890; "Die Vertheilung der Artillerie innerhalb des Armee-Corps"), which maintains that the abolition of the corps artillery would be of advantage in almost every case when the Army Corps was advancing on two roads, and that this might be accepted as being the rule. In answer to this the present writer seeks to prove that the contrary is the case, by means of numerous examples. Eight engagements and battles during the first period of the 1870–71 campaign, in which 31 Army Corps formed larger masses, are investigated to ascertain whether their advance was by one or by two roads. It is shown that the advance of 19 was on one road, and 12 on two, from which the conclusion is drawn that the advance by two roads is not the rule. But this result is only

obtained by including the battle of St. Privat. In regard to this there could be no question of the advance being on one road, the corps marched rather massed in broad columns across country. If these corps be excluded from consideration, there remain 11 corps that moved on one road and 12 on two roads. But from those 11 corps must be deducted also the IInd Bavarian Corps at the engagement of Weissenburg, the divisions of which on the day of the fight were 2½ German miles apart. The action of this corps tells altogether against corps artillery, and in favour of the distribution of the entire artillery to the divisions.

Field Gun-brake.—An effective brake has already been adopted for the field artillery in many States; in others experiments are still being made. Combined with the employment of smokeless powder, a good brake allows of the gun being made ready for firing again in a shorter time than was previously possible. The German regulations of 1877 laid down the rate of firing at from three to four shots a minute. Since that time sponging out has been discontinued, the new powder and side-sights facilitate the laying, and the brake will minimize the most fatiguing work of all, and that which occupies the most time—running up the gun after each shot. It is laid down that when the brake is used a battery of 6 guns will fire 10 to 12 shots in the minute, rapid fire, in place of from 6 to 8, as previously. Such an improvement cannot fail to produce a considerable effect; the question is how is this advantage to be utilized, and what consequences will result from it?

The opinion that the greater readiness for firing will in future lead to an increased rapidity of fire is very general. If hitherto with ordinary fire 3 to 4 shots a minute has been the rate, in the future it will be at least 5 to 6. Therefore regard must be had before everything else to the provision of ammunition with the batteries. If hitherto 135 rounds per gun has been considered a sufficient supply, then in the future about 215 will be required. But it is impossible either to place a heavier load on the ammunition wagons, or to increase the number of these from eight to fourteen, so as to carry the necessary number of rounds. It only remains, therefore, to reduce the size, and especially the weight, of the projectiles.

This train of thought, in which the conditions applicable to the rifle have been unconsciously referred to the gun, conceals a great error. With the rifle it is, as regards the effect of a hit, quite indifferent whether the bullet is a little heavier or lighter. Consequently, other conditions being equal, there is a probability of obtaining greater results from increased rapidity of fire. The conditions are altogether different with the gun, where the effect of shrapnel is influenced in a high degree by the number of bullets contained in it, and, therefore, by its weight. Whether 200 shrapnel of 5 kilos. or 125 of 8 kilos. are fired in the same time does not matter much, provided the number and power of penetration of the bullets are the same, and also the accuracy of the fire. But it is evident, that if in the 8 kilos. shrapnel, 3·4 kilos. (or 42 per cent. of the whole weight) are represented by the bullets, this proportion cannot be nearly attained with

the shrapnel weighing 5 kilos. Such a projectile, if constructed on the same principle as the shrapnel now in use in Germany, would at most contain 140 bullets. In firing 200 rounds, therefore, 28,000 bullets would be discharged on the enemy, whereas in the same time with only 125 shrapnel of 8 kilos., 32,500 bullets would be thrown, that is, 4,500 or 16 per cent. more.

The writer of an article in the "Jahrbücher für die Deutsche Armee und Marine" (December, 1891) discusses the effect of the introduction of quick-firing guns on the shooting of field artillery. He would effect the ranging by means of one section only of the battery, because the firing is then sufficiently slow to allow of this, and errors are better excluded if the battery Commander has only to do with two Nos. 1 in place of six. On the completion of the ranging the whole battery take up the fire, which should be conducted with the greatest possible rapidity. The writer estimates the power of the increased rapidity of fire so high that he believes it will again make artillery superior to infantry up to 1,500 m. In our opinion there is no unconditional superiority of the infantry over the artillery within this limit. If the artillery is in position, and is not surprised by the infantry, it will always succeed in driving them off at ranges of from 800 to 1,000 m.

On the other hand, infantry which surprises artillery can, even at greater distances, bring such a fire to bear on the artillery that their greater rapidity of fire will not help them. Until the ranging is completed this does not avail, for the next shot cannot be fired until the preceding one has reached its destination and been observed. But if the ranging has succeeded, the victory of the artillery is assured equally whether it shoots a little quicker or more slowly. Its fate now no longer depends on a few seconds; for, if the hostile infantry has not mastered the artillery while it was ranging, it will certainly never do it at all, and its unfitness for further fighting will be sealed by the next half dozen rounds.

Our view is that artillery now, as before, must adhere to the principle of observing every shot, even after the ranging is completed. The rapidity of fire will, therefore, not be materially altered; the average rate will perhaps be nearer four rounds than three in the minute, for the perception and observation of the shot on striking has become easier, owing to the absence of the disturbing smoke. We cannot count on any real advantage from the increased rapidity of fire. Either the ranging has been correctly accomplished, in which case the fight is disposed of by two rounds of shrapnel. Whether these are fired in three minutes or in a minute and a half is of no importance, for a change is hardly to be thought of after the ranging is completed. The decision has already been determined by the first round of shrapnel. But if the ranging is incorrect, the rapid fire that follows it is not only useless, but actually harmful, for it costs much ammunition, makes the recognition of the error committed more difficult, and causes unsteadiness amongst the gunners. We can only look for utility from a prolonged rapid fire in the case where the ranging has succeeded in forming a long bracket; the space between

the two distances ranged must then be swept rapidly to and fro by means of rapid shrapnel fire. This applies also to the bombardment of objects such as infantry, for example, sheltered behind earthworks of strong profile which offer little prospect of an effect being produced on them, and success against which must consequently be associated with a large expenditure of ammunition. In both cases sufficient effect can only be produced by a large number of rounds, perhaps forty or fifty, and therefore greater rapidity of fire may be of use. Instead of the object being rendered unfit for further resistance in perhaps fifteen minutes, this time might, by the employment of rapid fire, be reduced by a half.

We are of opinion that the greater readiness to fire can be best utilized by reducing the number of guns in a battery. Indeed, the strength of a battery should depend principally on the time occupied by the guns in getting ready to fire. A battery is properly composed —that is, it will offer the greatest possible degree of useful effect, if, in the ordinary firing from a flank, the gun on the one flank shall be ready to fire immediately the gun on the other flank has been discharged. If the batteries are stronger than they need be to satisfy this condition, then many guns are exposed uselessly to the enemy's fire, and consequently to losses. Thus, for example, even in the time of black powder the Austrian and Russian field batteries, of eight guns, were too strong, which has at length been recognized by them.

The sound deduction to be drawn from the greater readiness to fire would be, that the strength of a battery should be reduced from six guns to four, and the number of batteries increased proportionately. In an Army Corps that has the disposal of 20 batteries, 40 guns could be withdrawn from the firing line without loss of fire effect. If the men and horses thus made available were to be employed to form 2 or 3 new batteries, an increase in power would be gained far greater than is numerically expressed. Naturally 8 ammunition wagons, as before, must be retained for the batteries of 4 guns, for the 4 guns would fire just as many rounds in the aggregate as the 6 guns of which a battery now consists.

These small batteries would be better trained and easier to command, not only because all the batteries would have the same number of guns in peace and war, but also because the battery Commander can superintend and command orally 4 guns easier than he can 6, and because the number of Officers would be proportionately greater than hitherto. Moreover, the smaller batteries could utilize the ground better; difficulties as to space which necessitate the diminution of the intervals between guns would be altogether avoided. By means of both the effect of the enemy's fire would be diminished.

The smaller batteries would also admit of the provision wagons being reduced from 3 to 2, so that the battery would have 15 vehicles in place of 18. If this be the case 4 more batteries could be added to each Army Corps without an increase to men or horses. These 24 batteries, with a total of 96 guns, would undoubtedly be superior to 20 batteries with 120 guns, particularly for the artillery engagement, on which everything depends. The 24 batteries with 192

vehicles would not occupy any greater length on the march than the 20 batteries with 200 vehicles. Only when firing case and during prolonged rapid firing the small batteries would not produce the full effect of the larger ones. Case fire occurs so exceptionally that a tactical measure, otherwise desirable, should not be rejected on this account.

It is different in the cases referred to above, in which the end can only be gained by means of a greater expenditure of ammunition; somewhat more time would be occupied over this than with the existing constitution of the batteries. With single batteries half as much time again would be necessary; but this difference would undoubtedly be diminished in some degree by all the commands being executed more easily and quickly in the small batteries than in the larger ones. This must be especially the case in firing salvos, which would in such conditions be especially suitable. As also the number of batteries is increased, the difference in time would be still more diminished.

Extensive trials can only determine conclusively whether the supposition that batteries of only four guns can maintain an uninterrupted fire from a flank is justified in all circumstances, especially in difficult ground. If it is the case, then our proposal offers such considerable advantages, particularly for the artillery engagement, that its inherent imperfections are fully outweighed. In any case, the question what consequences will follow the increased readiness for firing due to the employment of smokeless powder and the brake is one of the most important of those awaiting early solution.

Tactics of Fortress Warfare.

Present Situation of the Subject.—The past year has resembled its predecessors in this, that numerous suggestions in regard to fortress warfare have been made by means of military literature; but the conflict over the questions connected with this warfare, in which hitherto the opposing ideas have come into sharp collision, has passed into quieter waters. The conviction has, indeed, made way everywhere that one cannot simply throw overboard all that science has hitherto taught on the subject, but that it should only be developed and modified in accordance with the spirit of the times. There is, therefore, nothing more to be heard about the theory of the superfluousness of permanent fortifications, of dismantling large places, or opening them to the rear, or about the idea that improvised and movable fortifications, which could be moved as required to the spot where they were wanted, would completely suffice.

On the other hand, it has been represented to the advocates of an earlier view, who wished to expend off-hand untold millions over the construction of the most complete fortifications possible on every important point, that it should first be considered whether the necessary forces and means existed for the efficient defence or use of these fortifications; whether, owing to the progress of artillery science, those works might not have become unserviceable before an oppor-

tunity should arise for them to fulfil their object, or if other technical progress would not make it possible to attain the desired ends in a simpler and less costly manner. The measures that all the greater States are actually taking for the protection of their territories follow in effect a line between these two extremes. Everywhere we see large sums being expended on those points at which changes in the strategical or political conditions necessitate new or modified constructions, or the security of new communications by land or water render fortifications indispensable.

All these measures, as well as the general inclination shown to include operations connected with fortress warfare in the peace exercises, and to bring them into connection with field manœuvres, point to the conviction that sooner or later modern armies will find themselves face to face with the problems of fortress warfare. There will not only be, as in former times, the principal operation of besieging or attacking large fortified places; but, even during the mobilization period and the first days of the war, fortifications and the fighting around them will play an important *rôle*. In regard to the latter, the deductions in General v. Verdy's work ("Studien über den Krieg, 1. Thiel, Ereignisse in den Grenzbezirken"), published last year, are very instructive, in dealing with the conditions on the frontiers during that period. Following the experiences of the last war, the principle has been generally accepted that the peace garrisons of the territories situated on the frontiers must be made stronger than formerly, so strong, indeed, that they shall be enabled to occupy important positions on the frontier, and maintain them until the arrival of reinforcements, so as to hinder as much as possible their being passed by hostile troops, and especially by cavalry swarms, which would disturb the mobilization, cause all sorts of damage, and produce a depressing moral impression. The writer does not contemplate any lasting favourable result from such enterprises, for it will often be found more difficult to get out of an enemy's country than it is to get into it; still these enterprises will be undertaken, and it is pointed out that the fortifications situated on the frontier must take an active part in frustrating them. It follows that, whether these be in the form of barrier forts situated at short intervals from one another, or of places of arms commanding an extended area of the country, both matériel and personnel must, wherever possible, from the first day of mobilization be ready to take part in military operations, and to maintain this activity whilst the mobilization is being carried out and ended.

In the same manner as this applies to the defence, so also the principle is now accepted for the offensive, that simultaneously with the mobilization of the field army, all the means required for operating against permanent fortifications must also be prepared. The general recognition of these principles and the preparations made for their application in the future mark an important advance in the tactical conditions of fortress warfare, as they existed in the last wars, and indicate further that the connection between field operations and fortress warfare has been drawn much closer. So

far as the matériel is concerned, these preparations have been carried out by all the great States. Constant endeavours have been made to develop the rifled system of ordnance in size and effect in many directions; the most powerful fire effect is at disposal upon objects of the most diverse nature, by the flattest as well as by a more or less curved trajectory. Sufficient mobility has also been given to a great portion of these guns—considerably superior in fire effect to field guns—to make them follow the field troops without difficulty when taking the offensive, or, on the defensive to take position rapidly at the most important points, and in case of necessity to change these positions. Besides this, measures have everywhere been taken to ensure the necessary train for the siege of fortified places being set in motion in sufficient time to obviate the necessity for the field army wasting valuable time after the investment, before the regular attack can be commenced, as was the case in 1870, before Paris. But if the progress in regard to the matériel has reached a point at which its cessation may be expected, this is not so in the case of the personnel. Certainly in the Reports we are able yearly to record certain advances in the increase, organization, and training of the troops destined for fortress warfare in all the great armies. In regard to the training, important steps have been taken, especially in Germany. But matters are still in the beginning stage, in this direction, and the fundamental ideas in regard to organization especially, which have for years past been discussed in the military press, have not yet found an outlet. In France, when Boulanger was War Minister, the idea was originated of uniting the fortress artillery and engineers in one body of troops, and in German military literature the view was frequently expressed that special fortress troops must be organized. The time is indeed long past when anything was thought to be sufficiently good for the defence of fortresses; everybody now knows that at least a portion of troops fully efficient for field service must be allotted to the garrisons of the fortified places in the vicinity of the theatre of war or of the frontier, and that they should have a knowledge of the country to be defended. Different arrangements have been made in different States for this purpose, such as the establishment of peace cadres for special infantry fortress battalions, detailing Line regiments which would remain in the garrisons in war, &c. But for that arm which in concert with the engineers would be most active in fortress warfare, the carrying out of a scheme of organization in accord with the new tactical conditions of this warfare is not completed. In Germany, however, such an idea is perceptible in the fact that many expressions of opinion respecting the insufficiency of the foot artillery have been discussed, and the new organization of the engineers and fortress services. The prevailing idea is undoubtedly to unite the foot artillery with the fortress pioneers in a separate body of fortress troops; the field pioneers to be amalgamated with the infantry, the instruction of which in pioneer duties would be extended, and that then a general staff for fortress warfare should be formed from these troops.

Russia.—The principal efforts have been directed to the extension of the railway system in the western portion of the Empire and the further completion of the artillery matériel. Although large masses of troops have been pushed forward near the western frontier, still it is of importance that sufficient lines of rail should be available for bringing up further reinforcements from the more distant portions of the Empire. Amongst others, two important lines have been made available, one from the Sea of Azof to Kursk to facilitate the transport from the territory of the Don Cossacks, the other in a south-westerly direction to Lodz. The latter was constructed during the great manœuvres in Volhynia by the railway corps, to the organization and training of which great care has been devoted. Other reports speak of the extension of the railway system in southern Russia; but the transport of large bodies of troops here would encounter great difficulties in the present distress in these territories, especially in winter. An endeavour is being made, therefore, to obviate these difficulties by laying a double line of rails on the main lines, and similar methods.

A 3rd regiment of light siege batteries was raised at the end of 1890, and these regiments are now stationed at Dunaberg, Bialocerkiev, and Novogeorgievsk; each consists of 4 batteries with 6 guns, 6 ammunition carts, and 18 ammunition wagons. The limbers carry only 8 15-cm. shot of 40 kilos., so that an adequate immediate supply of ammunition must be provided by means of wagons. The further supply has in the first instance to be obtained from the flying mortar artilery parks, of which there are in peace 2 and in war 4, with a probability of increase to 3 and 6. These in their turn are completed from the two movable mortar artillery parks, which are to be supplemented by another for the third regiment.

Much energy is being displayed in testing and perfecting the various auxiliary services, such as cycles, balloons, and range-finders. The former after many years of trial have been introduced into all the infantry field troops; they are destined principally for the special hunting detachments, and will be gradually attached also to the fortress and reserve troops. They would be used for the more rapid transmission of orders and reports during movement, and for the field post within the sphere of the quarters occupied by the troops, and in the field army. A detailed account was given in the "Militär Wochenblatt" (No. 78) of the experiments carried out respecting the effect of artillery fire on balloons. They were conducted as far as was possible under service conditions, and proved that a balloon could not venture into the sphere of shrapnel fire; for at a height of 1,200 feet the one fired at was struck and began to sink at the eleventh round.

As regards the personnel, according to the "Revue Militaire," 3 new fortress infantry battalions have been formed (2 at Zgierz, 1 at Kovno) each of 5 companies, 30 Officers, and 522 men. On mobilization each battalion would form a regiment of 5 battalions, 19 Officers, 4,926 men. After, in 1890, the 2 companies of fortress artillery of the Turkestan military district had been formed into a

battalion of 4 companies, there remained only 5 independent companies, 1 at St. Petersburg, Dubno, and Bobruisk, 2 at Vladivostok. The number of battalions is 51: 6 in each of the garrisons of Warsaw, Novogeorgievsk, and Cronstadt, 4 in Ivangorod and Brest-Litevsk, 2 in Ossovetz, Kovno, Dunaburg, Viborg, Sveaborg, Kief, Kertch, Kars, and Poti-Michaelovski, 1 in Dunamunde, Bender, Oczakov, Sebastopol, Alexandropol, Terek, Daghestan, and Tashkent. The battalions consist each of 4 companies, excepting those at Oczakov, Sebastopol, and Kars, which have 5, and that at Poti-Michaelovski, of 3 companies. There are 5 fortress sortie foot batteries in Warsaw, Novogeorgievsk, Ivangorod, Brest-Litevsk, and Kovno.

In the place of the two Directions for submarine mining services in the Baltic and Black Sea, 8 fortress torpedo companies have been included in the garrisons of Cronstadt, Sveaborg, Viborg, Dunamunde, Oczakov, Sebastopol, Kertch, and Michaelovski (at Batum).

France.—Although the railway system in this country has for long been far more complete than that in Russia, much activity has been displayed during the past year in extending it. In doing this the intention is evident to provide for the transport of troops and war material to the eastern frontier. For this purpose the construction which has been undertaken of a new line from Paris to Rheims is of special strategical importance, for it will provide a direct and rapid connection between these two places. The partial completion of a second set of rails between Veynes and Briançon is also of strategic importance; it will connect the latter fortress with Lyons and Marseilles, and will soon be joined to the lines to Nismes, Montpellier, and Toulouse, by a line to the Rhone valley. The opening of the following sections is also announced: from Aurillac to St. Dénis-les-Martel; Lons-le-Saulnier to Champagnols; d'Estrées to St. Juste-en-Chaussée; Charroux to Kessac-les-Châteaux (Givray-Leblanc line); Bayonne to Cambo; Bayonne to St. Jean Pied-de-Port, and the first section of the line Vigne-Nice, as far as Brézel. This last one, in spite of the protest of the military authorities, is laid with small gauge; but it is to have a third rail so as to be available in time of war for wagons constructed for the normal gauge.

As in former years, some of the older fortresses, that have lost their former value, have been dismantled, to assist in the equipment of new works. The fortresses of Douai and Arras are amongst these, and a portion of the Belfort ramparts, which have become unnecessary owing to the construction of new works. It has also been decided to construct six infantry works at Belfort, on the right bank of the Savoureuse. The strengthening of the Cherbourg fortifications, including the protection of the harbour, is also planned.

According to the "Revue d'Artillerie," the immediate object of interest, in regard to artillery matériel, is the construction and trial of quick-firing guns of heavier calibre (10-, 12-, and 15-cm.) for use, primarily, on board ship. In respect to personnel and auxiliary services, a Committee has been appointed to consider the entire question of cyclists. The adoption of permanent cyclist formations seems

secured after the favourable experience of them in connection with the manœuvres, and the necessity for them in case of war.

Austria-Hungary.—The credits available have, according to newspaper reports, been principally applied to ensuring the security of Transylvania against a possible Russian concentration in Bessarabia. There is, therefore, nothing of importance to record in regard to general organization. Further trials have been made with the 10·5- and 12-cm. howitzer, which are destined to supply a requirement still wanting in almost every artillery. These guns, equally well adapted to complete the effect of the field guns at the proper time, or for employment as movable siege and fortress guns, are destined to play an important part in the future. Attention is also being paid in Austria to the improvement of the projectiles and their effect, as well as to the new explosive. Experiments were made at Pressburg with "ecrasite" upon various objects, amongst which was a block-house redoubt 2 to 3 m. high, with earthen parapets and pallisades. It produced the effect of double its amount of dynamite.

It is interesting to remark that in Austria, as in Russia, special attention has been directed to the peculiarities of a winter campaign. In recent years the engineers have been occupied at their exercises with the construction of provisional shelters, camp details, snow huts, and the application of explosives in breaking up ice; experiments have also been made in transporting artillery equipages in deep snow.

Italy.—An armoured revolving tower has been completed at Spezia for the defence of the approach to the harbour. As regards the Alpine barrier forts, it is stated by the "Italia Militare" that arrangements have been made to occupy, during the winter, the six forts situated on the Col di Tenda and in its vicinity with a small detachment of the 1st Alpine Regiment and two men of the Mountain Artillery. As regards artillery matériel, attention has been principally directed towards increasing the effect of projectiles, to which the application of double fuzes to siege and fortress artillery has contributed. Experiments have been continued with the high-explosive "ballistite," which has been shown to be also adapted to use with field guns.

Some Questions of Fortress Warfare, with reference to the most recent Military Literature. As has already been noted, some certainty has resulted from the public discussion of questions connected with fortress warfare, that they are not to be met by a complete revolution or even by a change in the adopted methods; but rather by their proper development to meet the progress in armaments, new means of war, and the changes in the art of war necessitated by these. A basis is thus gained to which the solution of the questions of fortress warfare ever springing up anew in connection with the progress of technical science may be referred. If a glance be cast on the manner in which the various States are carrying out their system of fortifications, it will be seen that in the first place the ground is selected on the several fronts of the place to be fortified which appears to be the best suited for the main line of defence. Equally with fortifica-

tions for special purposes, such as frontier or coast defences, the most suitable points are chosen.

In these sections again the most important and commanding points stand out; but on these positions guns are not massed as formerly, for though these promise, indeed, an extensive fire effect, they mark also a very favourable object for the enemy's concentrated fire. As, however, this fire effect from the most commanding spots cannot be altogether dispensed with, they are occupied by a few of the most powerful guns, which are rendered as invulnerable as possible by the application of the most modern scientific means (Armstrong parapets covered with beton, &c.), and equipped with every expedient for easy service and good effect. The girdle-line, which is constructed in this way in most systems of fortification, now requires supporting points, and these must be established with special regard to the requirements of "infantry works," because the infantry will here have to play a principal part; the participation in support of light guns is not, however, to be excluded from the arrangements. In connection with the works referred to above, or covered by them, suitable positions will then be fixed for the principal artillery engagement. The place for the mass of long-range guns destined for this will be in the intervals between the forts and the supporting points, and generally in positions already prepared in peace-time. Further, by improvising positions in front and behind the girdle-line, as well as in this line itself, it will be possible to complete the passive by means of active defence, in a greater degree than formerly. In order, lastly, to neutralize the breaking through the girdle-line by the attackers—for this can rarely be rendered continuous and capable of resisting assault throughout—a citadel with closed *enceinte* cannot be dispensed with. If this is at a great distance from the girdle-line, it will be indispensable to prepare positions on the ground lying between the two fortified lines, by means of which the attackers who have made their way in may be repulsed; they will also be exposed in their position and during their eventual retreat to the fire from the gorges of the girdle-works.

This brief description of the present arrangement of permanent fortifications, so far as they are not affected by local conditions or special objects, corresponds in the main with the statements advanced in Colonel Welitschko's important work, mentioned in the last year's report. The principles enounced by the writer differ in individual points, because he had in his mind the conditions of the great modern fortresses situated in the flat ground of his own country. In the first place he wishes to banish all long-range guns from the forts; but by doing this the artillery of the defence would give up important advantages it possesses over the attackers.

The forts, which are mostly situated on commanding points, afford the guns an advantageous position in regard to view, observation, and fire effect; they admit of every preparation being made in peace-time for cover and effect, for easy service, ammunition supply, &c., for the employment of the latest scientific means, and they will allow the defence to bring guns into action of a calibre such as the attackers

will not often be able to bring up. The writer is against the use of armoured towers, and gives the preference to earth and beton for purposes of cover; but in this view he is pretty well alone, as is evident from a glance at the newest fortification works constructed in the various States; at least the use of both will remain in force for a long time to come. A further proposal of the writer's is to furnish the girdle-line with a line of rails protected by a glacis, and to connect with it numerous radial lines, so as to be able at any moment to bring a crushing fire on any required point. This proposal is not new, it is to be found in books of instruction at the beginning of the sixties; but it is to be remembered that the construction of the girdle-line with the necessary acquisition of ground demands enormous expenditure, and that with fortresses situated on uneven ground insuperable difficulties may oppose its construction. The working of the radial lines would be difficult to protect against interruption by the enemy's fire, so that good roads would often make more secure communications. Entirely in the sense of this report Welitschko points out the impossibility of replacing permanent fortifications by field works, and also the necessity for closed defensive lines. He further expresses himself energetically against the predilection of many for fortified advanced positions far to the front, whereas he advocates sorties. Here also it has been held that advanced positions must always lie under the commanding fire of the girdle-line, unless their occupation is to operate to the disadvantage of the defenders, and that the centre of gravity of the defensive action must always be placed on the girdle-line, and not in the advanced positions.

Following the foregoing principles of Welitschko is a proposal for the type of a supporting point in the girdle at Miaskouski, communicated by Captain Bussjager. He wishes also to dispense with any long-range guns in the forts, and regards the purpose of these to be fulfilled if they arrest during the entire course of the siege all attacks on the contiguous intervals, and by this means force the attackers to capture the supporting points, which can only be done by regular approaches, provided the detailed dispositions are suitable.

Another Russian author (Enzmann) expresses his views in regard to these dispositions. The supporting points of the girdle-line should, he says, be in part such as will be safe from assault on account of natural obstacles, wet ditches, &c. But the rest will have to be secured by means of artificial obstacles of the most varied description. To this end the construction of, or preparation for, a suitable system of mines is specially recommended. The defenders must endeavour to dispose and equip all the supporting points of the girdle-line in such a manner as to force their opponents to proceed by regular approaches up to the crowning of the glacis. On the other hand, the attackers will regard as next in importance to securing the preponderance in the artillery engagement, to resort to a shorter method of attack whenever and wherever the opportunity offers, and endeavour to seize by assault one or other of the supporting points. Though such an undertaking can only be exceptionally allowable and

successful, in face of the actual means of defence, still all armies must be prepared to resort to it and exercised in overcoming obstacles.

This is being done especially in the Russian Army, as is to be seen from the reports concerning the exercises there of the sapper brigades; they also furnish information regarding the means of surmounting different kinds of excavations and artificial obstacles. In connection with this, a suggestion is offered, that for the difficult work referred to a special formation, such as exists in Russia, may perform good service. Up to the present, intelligence has only been received of the employment of the "hunting" detachments in extraordinary performances, which are of value only in connection with field work; but, as they are formed of men selected for special boldness and physical qualifications, who are trained to overcome difficulties and dangers, they would find a suitable field of action in the most difficult tasks of fortress warfare. These formations, the creation of which in Russia is justified by the unequal quality of the material for filling the ranks, and for the action of which a favourable ground is offered by the peculiar condition of the country, have not been considered necessary in other countries.

But this reference to them attracts attention to the questions connected with the tactical employment of the special infantry formations as they exist in Germany, that is to say, to the jäger battalions. The latest war experiences had justified the previously often-repeated opinion, that the disadvantage of such a special body of troops was that often they were not on the spot where better value could have been expected from their employment than from other troops; and, on the other hand, they had to be employed in the same way as these where the numerical inferiority of the latter made it necessary. This was the reason that they were constantly employed on outpost duty during the investment of fortresses, and also in other places they were preferably utilized for this purpose, when infantry could have performed it equally well. In consequence of these experiences, a cry was raised at the time against the whole arrangement; but, apart from military considerations, there were other grounds for their retention. But now the question being discussed is how their advantages can be better utilized in war than formerly.

In fortress warfare the jäger will only be employed exceptionally and where their special shooting qualifications can be made use of, such as to fire at letter-carrying pigeons, &c., and they will be at the disposition of the General Commanding for special purposes, such as the protection of communication to the rear or other missions, also to be held in readiness as a reserve. At the commencement of the formal siege, the jäger battalions that can be dispensed with on the other fronts will be assembled on the field of attack and made use of extended in the most advanced trenches, where their superior shooting will be of value, especially when closely engaged. Similarly, as regards their employment in the defence of fortresses in which the Commandant reserves to himself the disposal of the jäger. They would there be attached in small groups to the infantry outposts, especially on the front of attack or where they are likely to be of

special use, and employed in minor undertakings, sorties, &c., and, lastly, employed against the enemy when fighting at close quarters.

The above-mentioned questions of fortress warfare, which have been prosecuted with so much attention in the Russian Army, have been accepted in France, so far as Welitschko's views are concerned, as is evidenced by the new fortifications at Belfort. According to "La France Militaire" the object is to form from a number of existing works of the first class the same number of independent groups of fortifications which will be strengthened by works of a subordinate kind; by this means the works of the several sections will be made independent of one another. The works to be constructed will receive infantry troops and provide secure shelter for them; they are, therefore, called "infantry works." A similar agreement of view occurs in the question of the fortification of the capital, regarding which the Russian General Kui has delivered a lecture in St. Petersburg (see the "Militär Wochenblatt," No. 20). He stated that this undertaking is only necessary when the capital represents, so to speak, the head and the heart of the entire country, and when its fall would represent the end of every struggle on the part of the nation and the destruction of the Empire, a fall which is accepted as applying to France, and which, therefore, justifies the endeavours to make Paris into an important place of arms, whereas the conditions are different in Russia. It is admitted that the circumstances of most of the other States resemble more closely in this respect those of France than the conditions in Russia; consequently the necessity for fortifying most of the capitals. Where this cannot be carried out in peace-time, then, as already mentioned in these reports, on the outbreak of war, the defence of the capital must be taken into consideration, and can be sufficiently provided for by the existing means for provisional works. According to General Kui, the best results will be obtained from fortifying a capital when:—(1) it is not exposed to the dangers of starvation or of bombardment; (2) the regular attack by the enemy will meet with difficulties; (3) the offensive operations of the defending army can be carried out without hindrance; (4) the garrison can be separated from the inhabitants. This is certainly true, but these conditions will not generally exist in capitals.

The General recommends two methods of fortification—1st, a normal fortress with advanced forts a long distance in front; 2nd, a town surrounded by intrenched camps (Brialmont's system). The latter would certainly be the most suitable for all great capitals if they have no old fortifications. Lastly, the General considers the best system of defence to lie in the manner of grouping the fortresses; this, also, is certainly correct, but most States are not in a position to undertake a new grouping, and can only complete and improve the existing system.

THE FRENCH NAVAL MANŒUVRES.

Prepared by permission from the special correspondence of the "Temps," by Commander H. GARBETT, R.N.

THE French Naval Manœuvres of this year have been of a totally different character to those of 1890 and 1891.

In 1890 the junction of the Mediterranean Squadron with the armoured division of the North in the Channel afforded a good opportunity for the study and practice of the different tactical formations of a fleet. In 1891 the fleet, which must be considered as possessing somewhat less speed than the English ships or the latest constructions in the Italian and German Navies, had a very important question to solve, viz., whether, in spite of a certain inferiority in speed, it is possible for a squadron to keep touch with another, by means of fast cruisers. The manœuvres of last year in the Mediterranean furnished some useful lessons on this head. The reports of the Commanding Admirals and the Captains of ships which took part in the manœuvres of 1890 and 1891 have formed a basis on which to lay down a new system of naval tactics.

A Commission appointed by M. Barbey, the Minister of Marine, in last October to enquire into the question, forwarded at the beginning of this year to that Minister the results of their work. Although the theories of naval war have been, in a general point of view, sufficiently studied, certain special points remained to be considered, necessitating a careful enquiry into the coast defences and their organization.

Last year, both in the Chamber and Senate, a certain disquietude was manifested with regard to the system of coast defence; a measure was introduced on this subject, in addition to which the report of M. Brisson on the Naval Budget contained, among other reforms, a plan for the complete reorganization of the "Défense Mobile" of the ports. Although M. Brisson resigned his chairmanship as President of the Committee before the discussion on the Budget, the measures which he recommended have been partly adopted. The system for the "Défense Mobile" has been modified, and this year's manœuvres had for their object the ascertaining of the efficacy of the measures taken, and the principal interest, therefore, has been centred on the defence. The scene of operations by the Mediterranean Squadron against the coast was comprised between the meridians of Cape Couronne and Villefranche, and that of the Northern Squadron between the meridian of the rocks of Primel and the parallel of the Island of Sein. It was not considered necessary to prepare a settled programme in advance for the movements of the belligerents. The *rôle* of the coast defence is to guard

against all surprises and unexpected attacks. The belligerents, that is to say, the Commander-in-Chief of the attacking fleets and the Maritime Prefects commanding the defending forces, were allowed perfectly free hands.

The resources at the disposal of the Maritime Prefects for the protection of the coasts of their arrondissements are of two kinds, those which constitute the means of defence properly so called, and those which are simply accessory thereto. The first category comprises the coast batteries, the mobilized coast-defence vessels, the torpedo-boats, and the mine-fields and other obstructions laid down at the entrance of the harbours; in the second category are included the means for scouting and transmitting intelligence such as semaphores, telegraphs, carrier pigeons, balloons, &c.; all these were placed at the disposal of the Maritime Prefects.

The following measures were taken for the Intelligence Service:—Each of the Maritime Prefects was to establish a central bureau for intelligence at a place selected by himself; the personnel of the semaphore stations within the limits assigned for the operations were placed on a war footing, carrier pigeons were distributed among the different stations and vessels, while the small squadrons of torpedo-boats which were under the orders of the Commandants of the "Défense Mobile" were ordered to keep as complete a touch as possible with the intelligence bureaux, semaphore and signal stations, &c.; submarine microphones were laid down in a belt outside the harbours so as to communicate the approach of any vessel at night, and telephonic communication was established between the coast batteries, &c. At Toulon, the only port possessing a naval balloon station, the balloon service under the direction of Lieutenant Rageot de la Touche carried out trials night and day, while twelve engineers from the garrison at Nice were also detailed to carry out experiments with the heliograph during the manœuvres.

As the operations were intended solely to test the efficacy of the organization of the coast defence, no Umpires were appointed; they afforded, however, opportunities for the attacking squadron to land men, destroy railways, and bombard unprotected ports. It is the first time that manœuvres of this kind have been carried out in France; the only attempt of a somewhat similar nature was the defence of the port of Toulon, ordered by Admiral Krantz when Minister of Marine. The defence was then entrusted to the marines and land forces, but the experiment did not produce the result expected.

This year the naval forces were alone called upon to protect the coast, and the defence was entirely organized by the Maritime Prefects. The experiment was looked upon with great interest, as it gave the Prefects the opportunity rarely afforded them of exercising military command.

It will be more convenient to follow first the operations against the Mediterranean coast, and then those of the Northern Squadron against Brest, Cherbourg, Havre, &c. Unfortunately only a general idea of what took place can be given, as the reports, even of the special correspondents, are of a decidedly meagre description.

The naval forces which took part in the operations in the Mediterranean were the Active Squadron of the Mediterranean Fleet, under the command of Vice-Admiral Rieunier, consisting of :—

Battle-ships : "Formidable," bearing the flag of the Commander-in-Chief, "Courbet," "Dévastation," "Hoche," "Vauban," bearing the flag of Rear-Admiral Buge, "Amiral Duperré," "Amiral Baudin," and "Bayard."
Cruisers ("à batterie") : "Cécile" and "Sfax," this latter specially commissioned for manœuvres, and manned by Reservists.
Cruiser ("à barbette"), 1st class : "Jean Bart."
" " 3rd class : "Cosmao," "Lalande," and "Troude."
Torpedo-cruisers : "Condor" and "Vautour."
"Torpedo-aviso" : "Dragonne" and "Dague."
"Torpilleurs de haute mer" : "Aventurier," "Kabyle," "Ouragan," "Audacieux," "Téméraire."

The newly-formed Toulon Reserve Squadron, under the command of Vice-Admiral Vignes, consisting of :—

Battle-ships : "Richelieu," "Colbert," "Friedland," "Redoutable," and "Trident."
Coast-defence battle-ships : "Indomptable," "Terrible," and "Caïman."
"Torpilleurs de haute mer" : "Agile," "Bombe," "Éclaireur," and "Orage."
Transport : "Gironde."

The "Défense Mobile" of Toulon and the coasts under the command of Capitaine-de-Frégat Bonifay, which consisted of :—

Armoured gunboats : "Achéron," "Fusée," "Mitraille."
"Torpilleurs de haute mer" :—"Capitaine Cuny," "Capitaine Mehl," "Chailleur," and "Déroulède," and twenty torpedo-boats.

Eight of the latter belonged to the Algerian flotilla, and were temporarily ordered to Toulon, to increase the strength of the "Defénse Mobile" during the manœuvres.

For some six weeks previous the active squadron of the Mediterranean was engaged in tactical manœuvres, target practice, attacks on the coast, &c. ; between the 8th and 10th July, scouting operations combined with night attacks on one of the battle-ships, and four accompanying torpedo-catchers were carried out by a small squadron composed of the cruiser "Cosmao," the "torpilleurs de haute mer" "Aventurier," "Ouragan," "Téméraire," "Agile," "Orage," and "Éclair," temporarily detached for the purpose from the Active and Reserve Squadrons with a division of six torpedo-boats belonging to the "Défense Mobile" of the port of Toulon, the whole under the command of Frigate-Captain Bonifay acting under the orders of Vice-Admiral de Boissoudy, the Maritime Prefect. The squadron

broken up into four divisions proceeded to reconnoitre and search out the coast east and west of Toulon, but although they came into collision with the torpedo-catchers, the latter, thanks to their superior speed, were enabled to escape; neither do the night attacks appear to have been more successful, as on each occasion the torpedo-boats were discovered sufficiently early to prevent surprise.

The Reserve Squadron, under the command of Vice-Admiral Vignes, who hoisted his flag on board the "Richelieu" at the end of May, had been similarly employed in drilling and manœuvring, &c.; both squadrons returned to Toulon on the 16th of July, to coal and replenish with stores in readiness for the grand manœuvres; the harbour presenting a fine spectacle, as no less than seventeen battleships were lying there fully equipped and ready for sea.

On the 18th of July, the mobilization of the Reservists commenced, who, as soon as they had received their equipment, were placed at the disposal of the Commander of the submarine defences, a certain number being detailed to man the armoured gunboats, and the remaining torpedo-boats for the "Défense Mobile" with the transport "Gironde," the latter being temporarily attached to the Reserve Squadron to convey to Corsica the materials for constructing a large boom with which to close the harbour of Ajaccio, for which port the Reserve Squadron sailed on the evening of the 20th; during the next few days, in addition to other exercises, torpedo practice, night attacks by the torpedo-boats against the squadron, &c., the men were employed in putting the boom in position, in taking it to pieces, and embarking it again on board the "Gironde," the work being carried out on successive days until the men were familiar with the details.

The Active Squadron, under Admiral Rieunier, also proceeded to sea on the evening of the 20th, but anchored in the Gulf of Juan, where it remained until the 26th, landing battalions of seamen with field guns for drill, and exercising the steam and other boats with spar-torpedoes in attacking various ships of the squadrons.

On the evening of the 26th July the Maritime Prefect of Toulon and Vice-Admiral Rieunier received telegrams from the Minister of Marine, directing hostilities to commence at 8 A.M. on the following morning. At 5 A.M. on the 27th all the marine artillery and infantry detailed for service in the coast batteries during the manœuvres quitted their respective barracks and repaired to the posts assigned to them.

The flotilla of the "Défense Mobile" was divided into three sections: the 1st consisted of the armoured gunboat "Achéron," Commandant de Fraysseix, the "Capitaine Cuny," and "Déroulède," and four 1st class torpedo-boats, with headquarters at Nice; the 2nd of the armoured gunboat "Fusée," Commandant Swiencki, the "Chailleur," and "Capitaine Mehl," and two 1st class torpedo-boats, with headquarters at Marseilles; the 3rd, the armoured gunboat "Mitraille," Commandant Bonifay, and fourteen torpedo-boats, with their headquarters at Toulon. For a period of eight days previous to hostilities the whole flotilla had been carefully exercised and the

Reservists trained in their duties. These preliminary exercises had terminated the previous night by an attack on the "Mitraille" by the torpedo-boats, which took place off Sainte Marguerite, at the entrance to the roadstead of Toulon. The object was to prevent the gunboat entering the roadstead, the attempt to do which she had to give up. Although the night was dark, and the torpedo-boats carried no lights, they were well handled, and there were no collisions.

All the semaphore stations were placed on a war footing, and were under the direction of Commandant Lions; the captive balloon also made frequent ascents from the Croix des Signaux, but as the weather was hazy it was difficult to observe anything. The superintendence of the defence of the coast was confided to Capitaine de Vaisseau Rebufat, who took up his quarters permanently at the Croix des Signaux, acting under the orders of Rear-Admiral Romaure, the Major-General commanding the marine forces.

There being no appearance of the enemy, and no information transpiring from the signal stations, at 4 P.M. the "Mitraille" and torpedo-boats put to sea to scout, but returned at dark without having seen anything. Information in the meantime had been received that Nice and Villefranche had been attacked by an ironclad, two cruisers (the "Vauban," "Sfax," and "Lalande"), and two torpedo-boats, after they had first destroyed the signal station at Garoupe and the bridge at Loup; they were, however, driven off by the section of the "Défense Mobile," the "Achéron" chasing the "Vauban," and keeping her under the fire of her two 27-cm. (10-in.) guns for some time. According to the coefficient of strength laid down by the rules between the land and sea forces the enemy were considered to have been repulsed with loss from Nice. About 5 P.M. Admiral Boissoudy proceeded to make a personal inspection of all the measures taken at the entrance to the roads in view of the possibility of a night attack, which, in effect, did actually take place. About 11 P.M. a heavy fire was opened by the enemy's cruisers, presumably upon the electric search lights distributed along the coast. About 1 P.M. the enemy's whole squadron was signalled about 2 miles from Cape Sicié, and as they passed along the ships opened a heavy fire upon the different coast batteries, which replied vigorously. When off the island of Hyères a most dashing attack was made upon them by the torpedo-boats of the "Défense Mobile," the result of which was the most interesting episode of the manœuvres, viz., the placing *hors de combat* of Admiral Rieunier's flag-ship the "Formidable" and the cruiser "Sfax." So beset was the squadron by the torpilleurs that one of them, No. 140, was enabled, by making a circuit, to approach and torpedo the flag-ship and the cruiser before she was perceived. The torpedoes were provided with dummy collapsible heads, so that there might be no question as to when a successful hit was made. Admiral Rieunier himself admitted that his flag-ship would have been sunk, and sent his congratulations to the Officer in command of the torpedo-boat. No serious attempt was made to force the defences, and at 4 A.M. the enemy stood away to sea again. The defence had to acknowledge the loss of torpedo-boats 65 and 68, which, when scouting

from Marseilles the previous evening, were cut off and captured by the "Cécile" and "Cosmao." On the afternoon of the 28th the enemy again stood in, the "Sfax" leading, and attacked for half an hour the battery on Cape Sicié; afterwards steaming along the coast, they bombarded successfully all the batteries between Cape Sicié and Aigle Head, from which it would seem as if Admiral Rieunier contemplated the possibility of shelling the arsenal and naval establishments over the Isthmus of Sablettes. The night of the 28th–29th passed quietly, but some fresh disposition was made of the defence torpedo-boats, six being sent to reinforce the force at Marseilles, which was attacked by the enemy on the 29th; on the afternoon of that day also, in a strong breeze, the captive balloon burst, but fortunately no one was hurt. After the demonstration before Marseilles, the enemy bombarded the small port of Ciotat, but made no further attempt against Toulon itself, then destroying more of the semaphore and signal stations, Admiral Rieunier made another attack on Villefranche; on this occasion the place was considered to have been captured in view of the superior force brought against it by the enemy; but, on the other hand, the defence claimed to have successfully torpedoed the "Sfax," "Jean Bart," and "Cosmao." This brought the first part of the manœuvres to a conclusion, and both the Active and Reserve Squadrons, which latter remained exercising off Corsica, returned to Toulon to coal, &c.

The two squadrons again put to sea at 5 P.M. on the 7th August, leaving the anchorage in single column in line ahead, columns of divisions being formed when outside, the Reserve Squadron soon afterwards standing away to the southward, temporarily parting company with the Active Squadron. No further attempts were made against the coast, and the manœuvres partook for the most part of fleet tactics, the two squadrons acting against each other, and different divisions being pitted the one against another. On the evening of their departure, however, the Rieunier squadron was subjected to a grand attack by the torpedo flotilla from Toulon. Leaving the harbour in the evening, the flotilla, which consisted of the "torpilleurs de haute mer" "Chailleur," "Capitaine Cuny," "Capitaine Mehl," "Déroulède," and twenty torpedo-boats, about 10 P.M. fell in with the enemy off the Hyères islands. There was a bright moon, so that the attacking flotilla were discovered without the use of the search lights; in spite of this disadvantage several of the attacks by the torpedo-boats were successful, two of the battle-ships being torpedoed, while one torpedo-boat was put out of action as sunk. On the following day Admiral Rieunier proceeded along the coast testing the semaphore and signal stations, with the object of ascertaining how quickly orders and information could be communicated to him, and, on the other hand, how quickly reports brought in by vessels scouting could be transmitted to the authorities on land. During the manœuvres carrier pigeons were despatched both from the ships and the shore, while, during the second period of the operations, fresh experiments were carried out at the Crois des Signaux by a second balloon which had replaced the one which had burst.

The semaphore stations seem to have done their work well, Vice-Admiral Boissoudy having been kept thoroughly *au courant* with all that happened along the coast, and he had been able to direct the whole defence from Toulon. The pigeons sometimes carried their despatches well, but, on the other hand, there were several delays. At the termination of the manœuvres Vice-Admiral Boissoudy addressed a letter of thanks to M. Pierre Laure, the President of the Carrier Pigeons Society La Fortereuse, who had placed their pigeons at the disposal of the naval authorities for the manœuvres, in which he bears testimony to the valuable work done by the carrier pigeons of the Society, and to the patriotic zeal displayed in organizing so valuable a service.

On the afternoon of the 9th Admiral Rieunier's squadron anchored off Saint Tropez, and, reinforced by six torpedo-catchers and "torpilleurs de haute mer," prepared to defend the roadstead against an attack by the Reserve Squadron; mines were laid out, and other preparations made. Soon after 8.30 P.M. the cruisers which had been scouting returned and reported the appearance of the enemy, who were soon discovered off the entrance by means of the search lights, but, except for a heavy cannonade between the two squadrons, lasting over an hour, it does not appear that any serious attempts were made on the anchorage. The next day the operations came finally to an end by a grand sham fight between the battle-ships of the two squadrons. Both fleets joined company in the morning, and were divided into three divisions, two of which manœuvred against the third; here again, unfortunately, all details are wanting as to what took place and the results; the cruisers were employed keeping up communication with the shore between the defending squadron and the semaphore station at Cape Martin. At the conclusion the ships returned to Toulon, and the Reservists were discharged on the 13th August, after having been embarked twenty-six days.

We will now turn to the operations of the Northern Squadron, of which we have somewhat fuller details, as the special correspondent of the "Temps" gives a slight description of the nature of the defensive works of the two great ports of Brest and Cherbourg, and also glances at their weak points.

The attacking fleet in the north was the Northern Squadron, under the command of Vice-Admiral Lefèvre, and consisted of:—

Battle-ships: "Suffren," flag-ship of Commander-in-Chief, "Victorieuse," flag-ship of Rear-Admiral Barrera.
Coast-defence armour-clads: "Requin," "Furieux," "Fulminant," and "Tonnerre."
Cruiser ("à barbette"), 2nd class: "Rigault-de-Genouilly," specially commissioned for the manœuvres by Reservists.
Cruiser ("à barbette"), 3rd class: "Surcouf."
Torpedo-cruiser: "Épervier," "Wattignies."
"Torpedo-aviso": "Lance," "Salve."
"Torpilleurs de haute mer": "Défi," "Alarme," "Turco," and "Veloce," specially commissioned by Reservists, and attached to Northern Squadron for manœuvres.

The "Défense Mobile" at Brest consisted of:—

Coast-defence armour-clad: "Tempête" and nine torpedo-boats.

At Cherbourg:—

The coast-defence ironclads: "Tonnant," "Vengeur."
Armoured gunboats: "Cocyte," "Flamme," "Grenade," and fourteen torpedo-boats, to which were added two from Lorient and Rochefort.

The mobilization began on the 18th of July, the semaphore and look-out stations along the coast were put on a war footing, and the coast batteries manned. War, however, was not supposed to be declared until the morning of the 26th, the interval being employed both by Admiral Lefèvre's squadron and the defending forces in preliminary drills, reconnaissances by day and night, and generally testing the means of defence, including the submarine microphonic apparatus, which was laid down off the harbour's mouth to signal the approach of vessels at night; the search lights, both from the ships and shore stations, were also practised. The evening of the 25th was unfortunately marked by the loss of one of the torpedo-boats. The "Tempête" and her flotilla had put to sea in the morning to make a reconnaissance and exercise the semaphore stations; when approaching the harbour on their return about 10 P.M., the torpilleurs of Admiral Lefèvre's squadron were ordered out to reconnoitre the approaching vessels; both sides employed their search lights. Confused by the blinding glare from the "Tempête's" light turned full upon her, No. 76 ran across the ironclad's ram, and was so damaged that she sank almost immediately; all the crew were fortunately saved, although two stokers were badly scalded by the steam as the boiler blew up; the "Tempête" at the time was steaming about 6 knots.

The Northern Squadron put to sea from Brest at 6 A.M. on the 26th July, in splendid weather, to carry out a similar programme to that of the Mediterranean Fleet, the first part of the operations being confined to attacks on this harbour only. The "Défense Mobile" was under the orders of Captain Motet, of the "Tempête"; the torpedo-flotilla quitted their anchorage at the entrance of the military port, and were distributed in the numerous creeks which abound on that coast, in readiness for seizing any favourable opportunity to attack the enemy.

Brest is admittedly one of the strongest of the French arsenals; its natural advantages are very great; the approaches, bristling with small islets, reefs, and rocks, are dangerous for an enemy; the surrounding coast, broken up into deep bays, is particularly favourable for the "Défense Mobile," as torpedo-boats can lie concealed completely out of sight of hostile vessels; the cliffs are high and permit the look-out men to sweep the sea horizon in all directions, while the channel narrows at the entrance to a width of only 1,500 yards. Naturally, a considerable divergence of opinion exists between the Officers of the Navy and those of the land forces as to the impregnability or otherwise of the place. Many of the Naval Officers hold

that in spite of the batteries and mine-fields it is quite possible for swift ships to rush the channel and destroy the town and dockyard; artillerymen, on the other hand, while admitting that ships might pass one or two of the forts, consider it impossible for them to run the gauntlet of all; this is a question which cannot, of course, be settled by any peace manœuvres such as have taken place, the object of which has been to test the working order and efficiency of the mobile and shore defences, and in this respect the results have been considered highly satisfactory.

A little before midnight on the night of the 27th-28th Admiral Lefèvre made his first attack. The "Tempête" had taken up her station in the centre of the channel on a line between Point St. Mathieu and the Point of Toulinguet; two torpedo-boats were also stationed off each of these points, while the remainder of the flotilla was formed in two divisions, of which the one, distributed between the two sides of the channel, occupied on the north the small bays of Mingan, Elec, and Ste. Anne, and on the south lay concealed in the indentures of the coast of the Island of Roscanvel, the points of Kervinion, Cornouailles, and Robert; while the other division took post in the Bay of Bertheume, completely masked by the fort and point of Creachmeur. The night was extremely dark, but all the search lights between Minon and Cornouailles Points were in readiness. Towards 11.30 P.M. the microphonic apparatus, which, as before mentioned, was laid out in the form of a belt some two miles outside the entrance, signalled the alarm, and the search lights soon discovered the approaching enemy. The defending torpedo-boats immediately began to harass the hostile ships, and, although attacked in turn by the torpedo-catchers, they were enabled to find refuge inshore, from whence they returned again and again to the attack. The enemy succeeded in forcing his way into the channel, and the "Tempête" was compelled to fall back on the inner port, but in actual war it is almost certain that no ships could have penetrated further without being destroyed by the powerful guns of the land batteries, not to mention the mine-fields, no attempt to remove or destroy which was made. The whole channel was lit up as bright as day by the numerous electric search lights placed on the different points, on the Minou lighthouse on the north side of the entrance, on the battery of the Capucins on the Isle of Roscanvel, on Point Delec, Fort Robert, &c., and even if the first lights from their position had been destroyed by the enemy's fire, the others in more protected stations could still keep the whole channel illuminated. Not only are heavy guns now mounted on the summits of the different promontories, but every creek has its concealed battery, and as the guns are mounted but little above the level of the water their concentrated fire, even on an ironclad steaming at speed, would have a terrible effect, and the damage would be done almost before the ship would be aware of their existence; neither would it be possible for a ship to stop and attempt to engage any single battery, as in that case she would be brought under a concentrated fire from both sides of the channel. At 1.30 A.M. Admiral Lefèvre gave up the attempt

to force his way further, and signalled that he considered himself beaten.

The following day the attack was renewed about 11.30 A.M., in broad daylight. As a spectacle the whole *coup d'œil* was very effective as the fleet, in column of divisions in line ahead, advanced up the channel towards the harbour, opening a heavy fire on the forts on each side as the ships passed, which was returned with equal spirit from the batteries; but it is certain that no hostile ships could penetrate so far up the channel, as even if they had silenced the whole of the lower batteries and cleared a way through the mine-fields, which is very doubtful, they must succumb to the plunging fire to which they would be subjected from the heavy guns mounted on the heights of the Capucins and Toulbroch, to which no reply from a ship could be made, neither is it likely that these works could be silenced by bombardment from the sea. At 2 P.M. the battle ceased, and both attacks on Brest may be considered to have completely failed. Admiral Lefèvre anchored his squadron for the night in the Bay of Douarnenez, the battle-ships lying with their Bullivant steel nets out to guard against the attacks of torpedo-boats. Such an attack took place about 10 P.M. by seven torpilleurs of the "Défense Mobile," which, aided by a light fog, were enabled to approach within range and torpedo the torpedo-cruiser "Épervier," before they were either detected, any search light turned on them, or fire opened.

The next morning Admiral Lefèvre weighed and destroyed the torpedo station at Morlaix, which brought the first part of the operations to a conclusion, hostilities ceasing at midday.

The second series of the manœuvres began on the 7th August, the scene of operations being the coast of La Manche, bounded on the west by Cape La Hague, and on the east by Point d'Ailly, which includes the great commercial port of Havre and several smaller ones. As Cherbourg is the military port most exposed to a bombardment from the sea, it was desired to test the improvements introduced into its system of defence by the new works commenced in 1890. The flotilla of the "Défense Mobile" at Cherbourg is stronger than at any of the other ports, including, as it does, two of the coast-defence ironclads and three armoured gunboats. As at Toulon and Brest, all the measures for the defence were entirely in the hands of the Maritime Prefect, Admiral Lespès.

The last act of Admiral Lefèvre, at the conclusion of the first part of the manœuvres, had been the destruction of the small torpedo station at Morlaix, where an old wooden ship, the "Obligado," serves as a workshop and depôt. The place is practically undefended, the old castle of Taureau, which formerly guarded the port, being only armed with obsolete guns: there is nothing to prevent the landing of a force, as only a regiment of infantry, without artillery, form the garrison, and, in case of mobilization, its place is on the frontier with the rest of the 10th Army Corps. It would also be difficult to mass troops in the event of its being necessary to take steps to repel a landing on the Brittany coast, as the railways are absolutely insufficient; from Rennes to St. Brieuc and from Guingamp to

Kerhuon, that is to say, Brest, there is only a single line, and yet it is by that route that the territorial artillery would have to be brought from Rennes, just at the time when mobilization towards the east will render the working of the railways most difficult.

Bretagne is, however, but indirectly threatened. However valuable the possession of Brest may be, serving, as it would, as a place for victualling and shelter, it would not be an indispensable base for operations by the enemy. The occupation of Cherbourg would be much more useful to him, as it is within reach of Havre and the mouth of the Seine, that is to say, Paris. Cherbourg and Le Cotentin in the hands of the enemy would mean the annihilation of the national defence.

The manœuvres have been of considerable interest, as showing, without doubt, that Cherbourg, "that nest of bomb-shells," is less threatened from the sea than from the land. The danger will arise from the surrounding heights, which are very imperfectly fortified.

The defence of the harbour and arsenal is not so impossible as has been supposed. Of course we are far removed from the time when the breakwater was the only absolute protection. Steam allows of an entrance into channels without tacking: therefore these channels are now too broad. The breakwater is only about 2 km. from the military port, and 5 from the commercial, and modern guns carry a distance of 10 or 12 km.: but works are now in progress to narrow these channels by uniting the isle of Pelée and the fort of Chavagnac by means of breakwaters; as to the distance of the large breakwater, it must not be forgotten that it is fortified, and will shortly be completely rearmed with modern heavy guns, which will keep the enemy at a distance sufficiently far to prevent his being able to fire with accuracy. We can imagine what the 3,606-yard-long breakwater may become when well armed; in spite of the power of the projectiles of the present day, days of bombarding will be necessary to silence it, and, considering the price of modern projectiles, an enemy would recoil from such an enterprise; it must, therefore, be strongly fortified, after the fashion of the mortar batteries erected at the foot of the old forts of Vauban and Napoleon, which cover the access to the channels.

On the other hand, we can do nothing against an attack which had for its object the capture of Cherbourg from the rear. The harbour of La Hougue, which faces the Seine, and especially the small bay of Vauville, which faces the islands of Normandy, are not fortified. In case of an unexpected declaration of war, when the active troops will already be marching eastward, a strong squadron could easily throw on shore a body of men who, in half a day, would be able to reach the heights above the town, take the fortifications in reverse, and destroy Cherbourg and the arsenal. Caen, Rouen, Havre, and, consequently, Paris, would all be threatened.

We are looking at things in their worst light; it is to be hoped that the Cherbourg flotilla would be strong enough to frustrate any such attempt; but still a landing of this sort is quite within the bounds of possibility. In considering the question of the defence of

this part of the coast, the most urgent work seems to be the defence of Cotentin, and this could be done at but little cost. An enemy wishing to land is not likely to have siege material with him, and, therefore, it is not necessary to have here a fortress on the scale of those on the line of the Meuse. Good strategical roads, shelters for a few guns, redoubts overlooking the bays where a debarkation can be effected, railways allowing of the quick transport of reinforcements, and the construction of a few simple forts within a radius of 1 or 2 leagues of Cherbourg, would suffice. Cotentin, in reality, is only a peninsula adjoining the narrow isthmus, less than 10 km., between St. Sauveur de Pierrepoint and Port Bail. An arm of the sea at one time covered all this country; little by little it has receded, and a vast marshy valley has been formed, through which runs the Dauve. Without the sluices, erected at Caranton, this immense valley and that of Taute would again be covered by the sea. Napoleon began a canal to connect the sea at Caen and that of Jersey, so as to avoid the trouble of doubling the Capes of La Hogue and La Hague, but the project was abandoned. It ought to be possible to work the sluices so that this low country may be inundated if necessary, as can be done at Dunkerque; the country is then impracticable, save by the isthmus of Port Bail, which should therefore be strongly held. It ought to be possible by the railway, at the first alarm, to occupy all the country between Port Bail and the promontory called Nez-de-Jobourg. The hills of Flamanville should serve as a base for a corps of observation charged to prevent any disembarkation towards Carteret, or the Bay of Vauville; on the opposite side of La Hogue the new batteries of St. Vaast protect the great roadstead; but it would be well to have on the height of Montebourg a post of observation. Thus secured, Cotentin ought to be a large entrenched camp, inaccessible to an enemy who had disembarked, and would serve as a protection to Cherbourg from its principal danger, viz., an attack in reverse.

It is a matter for regret that the land forces have not taken part in the operations. It would have been most useful to have seen how quickly troops could be sent to points menaced by a disembarkation of an enemy. It is true that there are no field artillery or cavalry attached to the garrison of Cherbourg, but this grave want could be remedied by sending part of the territorial regiment of artillery and some squadrons of cavalry from Rennes, and, from this point of view, the question may well be asked if that town is the most convenient centre for the assembly of the forces, whose duty would be, above all, the defence of Cherbourg. The questions raised by the manœuvres are very grave: they touch the vital interests of the country.

The 7th passed quietly at Cherbourg; the "Tonnant," "Vengeur," and torpedo-boats being sent to scout for traces of the enemy. Rear-Admiral Mathieu, Chief of the Staff of the 1st Arrondissement, took up his post in the morning at the fort of Roule, which was made the headquarters of the defence during the operations. This fort and some other old redoubts, although now not armed, from their position on the heights overlooking the roadstead, form excellent posts of

observation. From the fort a fine bird's-eye view of the whole grand military port is obtained. The town, the roads, the ships, the enormous breakwater, the insular forts of Chavagnac and Pelée Island, those of Querqueville and the Flamands, which complete the maritime *enceinte*, all stand out with the distinctness and precision of a plan in relief. It is easy to understand that the weak point of the defence is the stretch of deep sea between Pelée Island and Cape Levi, called the Roads of Grumes. These roads could be easily occupied by an enemy's squadron, and from there he could enfilade all the defences of Pelée and of the breakwater. It is in order to remedy this danger that the pass between Pelée and the coast is to be closed by a breakwater, which will be powerfully armed, and that at the foot of the heights on a level with the sea powerful mortar-batteries are to be placed, designed to pour a plunging fire upon hostile ships which may take up a position in this roadstead.

A little after midday a telegram was received that the squadron had passed some distance off Cotentin, in sight from the semaphore at Ailly, near Dieppe. If the enemy had Cherbourg as its objective, he might be sighted about 5 P.M. Should Admiral Lefèvre, however, pass the estuary of the Seine, he would probably be intending to make a demonstration against Havre, and to destroy the coast defences and semaphores before appearing against Cherbourg. Admiral Lespès had foreseen this, and detached the armoured gunboats "Flamme," "Grenade," and "Cocyte" to share in the defence of the great commercial port. This rich city would, in time of war, offer a strong temptation to an enemy to attempt to destroy its wealth, and to levy a heavy contribution upon the town. Some years ago the defences were strengthened, and it is proposed now to erect some new batteries similar to those in the Brest Channel and at Cherbourg. In addition, the estuary will afford a good shelter for the torpilleurs and gunboats, which will be a powerful aid to the shore batteries. The demonstration of Admiral Lefèvre will have for its result to make known the exact values of the fixed and mobile defences, and to indicate the weak points of the organization. According to the reports from the semaphore stations, Admiral Lefèvre proceeded methodically. He bombarded the stations at Entretat and Cape Antifer, after passing before Fécamp, without disturbing that port. The semaphores destroyed, he was able to arrive before Havre without being signalled. At 1 P.M. the semaphore at Octeville telephoned to Havre that the enemy was in sight, about 15 miles north of La Hève, and steaming rapidly towards Havre. At 2.30 the vessels of the "Défense Mobile," which had been scouting all the morning outside, came into action with the enemy, but, being much inferior in force, they had to fall back under protection of the guns of the batteries, which opened fire about 3.30 P.M.; the squadron made no attempt to force the harbour, and, ceasing fire a little after 4 P.M., stood away out of range.

The batteries were manned by the men of the 11th Regiment of Artillery and of the 1st Fortress Battalion, which were mobilized for the purpose, and occupied the batteries of Floride, Huguenots, Epi-à-Pin, Hève, and Frascati.

The night passed quietly, both at Havre and Cherbourg, and, as it was quite clear, with a bright moon, it did not offer a favourable opportunity for the vessels of either side to attempt a surprise.

The next day, the 8th, it was expected that the enemy would attack Cherbourg; the various semaphore stations between Trouville and the Point of Cotentin signalled them as they passed up the coasts, and for a short time they were in sight from Cherbourg itself, but about 11 A.M. a heavy fog set in, obscuring everything; in the afternoon, when the fog lifted, however, they turned off and bombarded some of the forts between La Hogue and Havre; in the evening it was signalled that they had anchored off La Hogue, which is the only anchorage from Cotentin to the mouth of the Seine where vessels can lie sheltered from the west winds; the holding ground is excellent, and it lies about 2 miles to the southward of the fortified island Tatihon. Immediately on the receipt of the information, Admiral Lespès determined to disturb them, and six torpedo-boats, under the orders of Capitaine de Frégate Ingouf, were despatched for that purpose; about 11 P.M. the small squadron approached within range, but the hostile ships were keeping a sharp look-out, and their search lights swept the sea, the powerful rays crossing each other in all directions. The torpilleurs were discovered, almost immediately, and the fire of the Hotchkiss guns directed against them; under these circumstances, and as there was, in addition, a bright moon, the attack must be held to have failed; it is, however, only fair to state that the torpedo-boats claimed to have torpedoed the "Requin" and "Furieux." The struggle lasted a little over an hour, and Commandant Ingouf and his flotilla reached Cherbourg again about 2.30 the next morning; the enemy quitted their anchorage a little before 10 A.M., and were soon signalled as steaming towards Cherbourg. The weather was very suitable for a surprise; it had rained hard part of the morning, dark and lowering clouds hung over La Manche, sometimes so thick as to hide the sea. Towards 11, the "Tonnant," with the small squadron of torpilleurs, under Commandant Ingouf, left the harbour by the Eastern Channel, the "Vengeur" remaining in the harbour ready to move when required; the batteries were manned ready to open fire; soon the rain began to fall in torrents, hiding everything, but at noon a breeze sprang up, clearing away the mist, and the enemy was discovered, with the "Suffren" leading, steaming towards the Eastern Channel. All the batteries and the coast-defence ships opened fire upon them, but the hostile ships continued to advance without returning a shot; at 12.15 a cloud of smoke belching from the "Suffren's" battery was a signal to the rest of the squadron to open fire, in turn, upon the defenders, and the action then became general. The squadron presented a fine sight as they defiled in line ahead past the breakwater, half hidden at times in the smoke which hung heavily about; in war, the new smokeless powder will give the defence a marked superiority over the attack, as the ships must always remain full in sight, while the batteries will be invisible.

The torpilleurs formed in line under shelter of the forts between Querqueville and Chavagnac awaited the moment of attack; at 12.30

the "Suffren" reached the extreme end of the breakwater, and Commandant Ingouf launched his flotilla upon the hostile ships, supporting their attack by the "Tonnant"; they were immediately perceived and the quick-firing guns from the tops of the battle-ships opened upon them, while Admiral Lefèvre, in turn, ordered his own torpilleurs forward to attack, and whatever else may have happened, it is certain that several of these little craft in a real struggle must have been sunk; as it is, their swift movements to and fro brought into greater prominence the stately movements of the big ships; the spectacle had a severe beauty of its own—forts, breakwater, ships, and torpilleurs seemed to float in the smoke as the breeze drove it over the sea and hills. The enemy, instead of penetrating by the Eastern Channel, found himself unable to maintain his position in face of the overwhelming fire from the forts, and stood out to sea again, followed by the torpilleurs, which kept up the chase, until the fog settling down again, his ships disappeared under its shelter, and the small craft returned to the harbour.

Admiral Lefèvre renewed his attack again after dark; he was favoured by the night, for the moon was obscured and the heavy clouds hung low over the sea; it blew fresh from the north-east and there was a choppy sea. From the time it became dark, the electric search lights on the land were sweeping the roads and open sea, while the "Tonnant," "Vengeur," and torpilleurs were scouting outside.

Soon after 9 the enemy were discovered off the entrance to the Eastern Channel; the vessels of the "Défense Mobile" were driven in, pursued by the squadron which soon arrived within one of the zones of light, when the forts immediately opened fire upon them; the western batteries, Sainte Anne and Querqueville, placed within the luminous radius of their search lights, could see and fire upon the squadron, but on the north front, the batteries being between several of the streams of light, the gunners could see nothing and vainly strove to lay their guns, but were unable to fire. The squadron made a direct attack upon the breakwater, steaming along it towards the east; all the guns of the immense mole were in action; the red flashes and the clouds of smoke stretched over a line more than three miles long; the rays from the search lights formed a phosphorescent band, in which the smoke rolled itself into fantastic clouds. The squadron used their search lights but sparingly; a ray of light occasionally streamed for an instant over sea, breakwater, arsenal, and the heights of Octeville and Roule and then disappeared. The bombardment attained its height at about 10.15, and continued until 11 P.M., when the enemy again stood out to sea for the night, leaving it uncertain whether they would make another attempt against Havre on the morrow or once more try to force the entrance to Cherbourg. In the morning a red flag hoisted on Fort Roule announced to the forts and the "Défense Mobile" that the enemy was in sight; all the morning they remained at sea out of range but in sight. The "Tonnant" and "Vengeur" remained under shelter of the breakwater, while the torpilleurs cruised in the channels. Towards 3 P.M. the squadron

once more stood in towards the western entrance, opening fire upon the forts of Nacqueville, which was immediately returned. The "Vengeur" took up her station at the entrance and opened fire upon the "Suffren," which was leading, and soon from all the batteries heavy clouds of smoke began to rise. The "Tonnant" steamed towards the Eastern Channel, but the water was too low for the squadron to attempt to force that entrance before night, and the attempt had to be made by the west. The attack was fine spectacularly, as the ships came entirely into sight firing upon the defences; it blew from the north-east and the sky was cloudy, but the day was not so dismal as the previous one. The "Suffren," preceded by a despatch-boat, passed majestically before the end of the breakwater, followed by the rest of the squadron, and attacked it in front; its guns replied, and then the eastern forts, in their turn, took up the fire. The "Tonnant," advancing to open fire, managed to place herself in the way of the forts of Flamands and Tourlaville, which, consequently, were reduced to silence; at 4 P.M., when every one was expecting to see him attempt the Eastern Channel, Admiral Lefèvre gave it up, the "Suffren" altered her course to the north and, followed by the squadron in two divisions, steamed seaward again. The attack had failed, but the squadron still remained in sight. No further attempt, however, was made, and at sunset the hostilities came to an end and the manœuvres were finished.

The reports of the Admirals and Maritime Prefects have not, as yet, been made known, but it is possible without them to draw a few general conclusions.

It is difficult to draw comparisons between the two series of manœuvres, not merely because the naval forces in the Mediterranean were far stronger than those in the north, but also because the zones of operations were very different. In the north a tidal sea runs strongly, the coast is a dangerous one, the currents strong and uncertain, and shipwrecks are frequent; on the other hand, the bays, estuaries, and numerous small roadsteads, closed by small islands, offer everywhere concealed places of refuge to torpedo-boats; at the same time an enemy might be able to push his light vessels nearly to the heart of the Armorican Peninsula; it is true the destruction of the railways would be difficult, as they lie well back from the coast; and if Méangon, Guingamp, and Morlaix are protected from a *coup de main*, the war, save in the case of an attempted landing, must be an essentially maritime one, as there are no objects of attack for a squadron, land defences existing only at the great ports.

In the Mediterranean there is no tide, no estuaries, the coast is nowhere deeply indented, the harbours and towns, with scarcely any exceptions, all face the open sea. Cette, Marseilles, La Ciotat, Antibes, Nice, Menton are all exposed to insults from an enemy. In addition, the points where a landing can be effected are numerous: Port-de-Bouc, La Ciotat, Bandol, Cavalaire, Cannes, the Gulf of Juan, are all points where a landing can be easily effected. Thus on the 22nd July, Admiral Rieunier at 6 A.M. landed two battalions of seamen, two field batteries, with squads of miners from the torpedo-

boats under cover of the guns of the fleet on the shore of Jouan-les-Pins, and moved them on Antibes. The question is, are the mobile land forces in a position to oppose such attempts? This has never been tested, and the fact is much to be regretted: But one fact is certain; it is that, in the Mediterranean this defence is pretty nearly condemned to remain helpless, because the coast railway is directly exposed to attacks from a squadron. From the tunnel of Nerthe to Marseille, from La Ciotat to Toulon, from Saint Raphael to the frontier the railway runs either along the coast or on the side of the mountains, and the bridges and viaducts can all be destroyed from the sea by any vessel keeping at a distance of 10 km. Thus Admiral Rieunier repeated the classic operation of destroying the viaduct of Bandol, the finest of the works connected with the railway, and also the bridge over the Var. It is a matter of congratulation that a third line of rail has been provided to the southern railways of France. The line Draguignan—Grasse—Nice and that of Digne—Paget—Théniers—Nice ought to be able to supplement a little the great coast line. It would be well from this time to look upon these lines as the real strategic railways of the Mediterranean, and consequently to improve the junctions towards Meyrargues, Gardanne, and Cannes. The only point common to the two zones of the manœuvres was the presence on the sea-board of two important commercial towns. Havre in the north and Marseilles in the south are both tempting preys for an enemy.

To judge from the operations, Admiral Lefèvre failed against Havre, but as the dispositions of the land forces for the defence were supposed to have been studiously kept secret, and as his squadron was small, and he could not be aware of the numbers of the forces concentrated to resist any attempt at landing, it is scarcely to be wondered at that he forbore to essay a landing, and contented himself with doing what damage he could by a bombardment. Admiral Rieunier, on the other hand, was successful against both Marseilles and Nice, in spite of the fortresses which cover them. Havre is less well defended by the forts of La Hève than Marseilles by those of Pomègue and Ratonneau; there is, it is true, the shelter afforded to the "Défense Mobile" by the Seine, but the haven of Pomègue is also a shelter, so the results are contradictory.

With reference to the "Défense Mobile," it also proved itself stronger in the north, Admiral Lefèvre having recognized that on different attempts he was repulsed by the torpedo-boats as much as by the land batteries, while in the Mediterranean the torpilleurs suffered heavily, although they achieved one notable success, viz., the placing *hors de combat* of the "Formidable" and the cruiser "Sfax," still, on the whole, Admiral Rieunier was successful: he captured Villefranche and the Hyères Islands, besides the destruction of the torpedo-boats in the Gulf of Saint Tropez by the "Cécile" and "Cosmao." In the north the squadron only achieved a success against the torpedo-boats in the actions at Morlaix, and at the roadstead of La Hougue. But these two results should inspire grave apprehension, and ought to lead to a prompt improvement of the shore defences, as these are

the two places from which Brest and Cherbourg can be threatened in reverse. It is necessary, therefore, to guard against such eventualities by constructing fixed defences to cover these landing places, and still more to reorganize the territorial troops, so that they may be in a position to replace immediately the regular forces and marines on the outbreak of war. We know that it is considered sacrilege to touch on the organization of the Army, but it seems to us that in the local gunners at Lille, and in the territorial chasseurs, there is an excellent model to follow for developing a coast defence. It is necessary at any cost to appropriate for this defence all the territorial elements to be found on the coast. The superabundant maritime "Inscrits" would form excellent companies of riflemen and gunners, and strengthened by the territorial infantry and artillery might be depended upon to do excellent service. It could be admitted then that any landing or, at least, effective occupation of any point of our coast would be impossible.

There yet remains the danger of night attacks on the coast by ships aided by their search lights. Measures ought to be taken to increase the number of the search lights on land, or even to render them mobile by means of light railways. On various occasions we have seen batteries reduced to silence for want of these electric lights, and every battery ought to be provided with them. All the manœuvres since 1886 have shown that these lights are a most valuable addition to the means of defence of our coasts.

Such are some of the general considerations suggested by the manœuvres. There still remains for study the question of the semaphore stations; to prove their efficiency was one of the objects of the manœuvres, to destroy them the squadrons passed up and down the coasts. We hope before long to be able to speak of what changes may be necessary.

THE FIELD GUN OF THE FUTURE.[1]

By Major E. Lambart, R.A.

The question of the field gun of the future is exciting almost universal attention at the present time among Continental military authorities, who are all agreed at least on one point, viz., that the limit of the power of field artillery has by no means been reached at present.

Our own 12-pr. B.L. gun, which has been so confidently described by high civilian authority as "the best field gun in Europe," finds few admirers among foreign critics, and, as is well known, is not much loved by our own battery Commanders. Perhaps more than any other nation in the production of new weapons we lose sight of the adage, "L'inventeur est le serviteur du combattant."

In view of the more general interest taken nowadays by Officers of each arm in things pertaining to the others, a *résumé* of the writings on the subject of the future field gun which have recently appeared in French, German, and Russian journals may be worthy of a place in the pages of the United Service Institution Journal. By far the most important of these writings are the long and carefully argued essay entitled "Das Feldgeschütz der Zukunft," by the German General R. Wille, and the pamphlet by M. de Nordenfelt, "Notes sur l'Artillerie de Campagne à Tir Rapide."

General R. Wille is an Officer of established reputation in the German Army, the author of many valuable essays on field artillery subjects during the last twenty years.

M. de Nordenfelt is a writer of equal weight and authority as regards the designing and invention of artillery "matériel." The other papers referred to at the head of this article are criticisms more or less elaborate of the views advanced by Wille and Nordenfelt.

General Wille's proposed gun, as will be seen, is put forward not only as the most powerful gun that can be devised to satisfy the conditions of a field gun, but as the only and universal weapon for field artillery in the future, under all the varied conditions of the employment of horse and field batteries.

M. de Nordenfelt believes in the necessity for field mortars and howitzers as well as field guns, and in a separate pamphlet lays down the conditions for the latter class of weapon on the quick-firing principle.

[1] "Notes sur l'Artillerie de Campagne à Tir Rapide."—De Nordenfelt. 2. "Das Feldgeschütz der Zukunft."—Von R. Wille. 3. "Artillery Journal, Russian," March—June, 1892. "Invalide Russe," ditto. 4. "Revue d'Artillerie."—Capitaine Moch.

It will be convenient to take the ideal guns of Wille and Nordenfelt separately, as they differ very widely, and each author supports his proposals by arguments of great length.

Proposed Gun of General v. Wille.

The following are its principal dimensions :—

Weight of gun alone, 7·75 cwt.
„ shell, 14·3 lbs.
„ powder charge, 3 lbs. 5 ozs.
Length of gun, 9′ 2″.
Calibre, 2·756″.
Initial velocity, 2,625 ft.-sec.

General Wille's Gun.—It must be confessed that General Wille's ideal gun of the future is sufficiently startling in all its aspects, and even if such a gun, when built, fulfilled all the expectations he has of it, its monstrous length of 9 ft. 2 ins. would secure its rejection by all but the most infatuated theorists. The following is a brief *résumé* of the General's arguments :—

Weight of Shell.—The weight of his shell is based on the average weights of the existing German shells, shrapnel, and common. He looks forward to the adoption in the near future of a uniform weight for shells of all kinds, and considers that a shell of 14·3 lbs., even with his proposed reduction of calibre to 2·75 ins., would meet all the requirements of strength and interior space for bullets and powder.

Calibre.—General Wille's choice of calibre is also determined by taking averages, not in this instance of German guns only, but of the principal existing field guns of European Powers. Since the weight of shells for field guns, he says, is permanently settled within narrow limits by considerations of portability, &c., we must look to a reduction of calibre, and consequent increase of powder pressure in the bore, as a means of increasing our *initial velocity*.

Initial Velocity.—The increase of initial velocity (I.V.) is the General's *summum bonum*. He will hear of nothing against it, and, as will be seen hereafter, sacrifices everything to it.

After tracing the gradual increase of I.V. through the history of modern artillery progress, he boldly asserts that we have no reason to doubt the possibility in the near future, with the improvements in materials for guns and the future development of new powders, of obtaining an I.V. of 2,500 to 3,000 ft.-sec.! As to the general principle of the desirability of such, or, indeed, any further increase, he replies as follows to the usual arguments on the other side :—

"The I.V. already obtained is such as to give us sufficient remaining velocity (R.V.) against 'personnel' at all practical ranges, to give us also a sufficient cone of dispersion of shrapnel bullets, and a sufficiently deep danger zone of shrapnel fire. Increase of I.V. leads to a diminution of the *cone of dispersion* of the bullets, which

necessitates an increase in the *number* of bullets, and a consequent lessening of their weight." To this Wille replies that, in view of the progress of infantry tactics, it is imperatively necessary to increase the range and danger zone of shrapnel, which can only be done by an increase of I.V.

"The increase of range beyond the power of possible observation of effect is quite useless, and only leads to waste of ammunition. The present guns carry quite far enough." To this the General retorts that batteries must be supplied with more powerful field glasses! History tells us that the I.V. (and consequent range) of field guns has always been kept far in advance of that of infantry rifles, and the recent great increase in the range of rifles entails an increase in the shrapnel range of our guns.

With I.V. of 2,600 ft.-sec., he maintains that shrapnel range will be increased to $4\frac{1}{2}$ miles!

"Very flat trajectories, the result of very high I.V., are useless against troops behind cover, the angle of descent being so small."

The General says that, as far as that goes, the trajectories of the present guns are too flat for that purpose, and that it would be better to trust in the future to common shells charged with high explosive powders (such as melinite, &c.). It would be absurd to sacrifice our shrapnel fire against troops in the open to a desire to obtain the effects of curved fire.

"Remaining velocity (R.V.), which is the really important point in a field gun, does not increase in anything like equal proportion to the increase of I.V."

Wille replies that past experience points to a very large increase of R.V. at least with increased I.V., and quotes tables of existing and former guns to prove that guns of the present day have the same R.V. at 2,000 yards that the old guns had at 600 yards. He maintains that his proposed gun will compare with the present guns in R.V. as 6:3.

"A gun with such enormous I.V. will require an impossibly heavy carriage to stand its recoil."

Admitting the gravity of this objection, General Wille proposes to build his carriage in two separate parts, and to check the wheels by very strong spring brakes.

Accuracy.—Admitting that there has been no very great increase of accuracy as regards "direct hits" since the introduction of rifled guns, General Wille combats the idea that the accuracy of shrapnel is injuriously affected by the increase of I.V. owing to the inaccuracy of time fuzes. This, he maintains, is compensated for by the increased space covered by the bullets of shrapnel with greater R.V., and he claims for his proposed gun an increase of length of "probable rectangle," as compared with the present German guns, of

At 1,000 metres,	99	metres or	325	yards.
„ 2,000	„	24	„	78	„
„ 3,000	„	8	„	26	„

Number of Kinds of Projectiles.—In considering this question Wille

deals with four projectiles, common shell, shrapnel shell, case shot, and a shell charged with one of the new explosives, which, for want of a better name in our service, may be called a "battering" shell.

Shrapnel he gives the palm to as the "queen of shells," and with this opinion no artilleryman is likely to quarrel.

Battering shells already exist in different experimental forms in the French, German, and Austrian Armies. Their principal defect at present is that, as their bursting charges are of some kind of almost smokeless powder, they cannot be used for ranging purposes; in fact the range must be found with other projectiles before using them. When military chemistry has remedied this defect, General Wille would equip his gun of the future with only two projectiles, shrapnel and battering shells.

Against case shot he declaims in thirty pages of facts, figures, and inferences, which are briefly referred to below :—

"Case shot," says Wille, "was the own sister of round shot—together they gained honour and glory—together they may be buried without regret." Throughout the Franco-German war of 1870 only 0·12 per cent. of case shot were expended by the Germans, and for this result they dragged with them 54,270 kilos. (over 3 tons) of dead weight, and there was no single instance of case shot doing what could not have been done by common shell or shrapnel! Against infantry it is useless, as a battery would be annihilated at case shot ranges, and against cavalry, since only two rounds at most can be fired, the noise and flame, even if round shot were being fired, would have almost as much effect! It is claimed for it that it is always ready and always at hand, but Wille claims that shrapnel can be equally kept at hand by using portable magazines, and with his proposed very high I.V. the shell may be fired with the fuzes set at 0, and yet cover a depth of 350 to 400 yards. Needless to say on this point of the abolition of case shot the General has many opponents among his critics at home and abroad, as will be seen later.

Number of Rounds per Battery.—From the number of rounds expended in the principal battles of this century, Wille deduces—

1. That the expenditure has much increased in recent wars.
2. The average expenditure in a campaign was about $1\frac{1}{2}$ times the equipment of batteries.
3. Detached batteries seldom fired more than their equipment.
4. Heavy guns generally fired more rounds than light guns.
5. The expenditure was greater in big battles than in small.

From this last, he infers that horse artillery batteries may carry fewer rounds than field, since they are usually engaged in small combats.

The average number of rounds now carried in light batteries of all nations is 142, and in heavy, 128.

Basing his calculation on the experiences of the Franco-German War, General Wille allows his gun of the future 135—140 rounds per battery.

Mobility.—This very important question Wille goes into very fully, and traces the gradual increase of weight of equipment since the

early wars of this century, an increase which, he says, has been accompanied by a diminution in the number of rounds carried.

Taking as a basis for calculation a maximum weight per horse in a 6-horse team of 660 lbs. (we take 600 as the maximum), he arrives at a total weight for gun and limber in complete marching order in horse artillery batteries of 34·3 cwt., and for field artillery of 35·3 cwt. (without gunners).

General Wille is not a believer in the probability of horse artillery in a campaign being called on to make a succession of long movements at a very rapid rate, and, like a true designer of guns, says that it is worth while to sacrifice some mobility to increased power in the gun.

A peculiarity under this head in his proposed equipment is that the limbers should be fitted to carry five separate ammunition boxes, each containing six rounds.

In horse artillery batteries one of these boxes is left behind when the batteries are acting with cavalry divisions, but is again taken up (presumably from the nearest ammunition column) when the batteries form part of the corps artillery.

It will be seen that this furnishes a horse artillery gun with only 24 rounds, and a field battery gun with 30, viz., 12 and 6 rounds respectively less than our horse and field batteries, but General Wille reminds his readers that the Russian horse artillery limber only carries 20 rounds, including 3 case shot, and the French 90 mm. gun has only 26 rounds, including 2 case shot.

These proposed limbers are to carry in field artillery 4 gunners, 3 facing the horses, and 1 on a special seat, facing the rear.

The General strongly favours the idea that the ammunition wagon should, if anything, exceed the gun in mobility, and on no account fall behind it, and proposes the weights of his horse artillery wagons at 33·3 cwt., and of his field artillery wagons at 34·3 cwt. *without* gunners. Six gunners give an additional 9 cwt., or five gunners 7·5 cwt. As both horse and field batteries have 9 wagons, they will go into action with 738 and 828 rounds respectively, or 123 and 138 per gun (against our 108 rounds).

Question of "Universal" Gun.—In proposing his new gun as the universal or only gun of field artillery, General Wille argues that it will meet all the ordinary requirements of field warfare, including the attack of entrenchments, which, as we have seen, he proposes to destroy with "battering shells" from his flat trajectory gun, and subsequently to resort to shrapnel against the troops seeking shelter in them.

If we are to provide guns to meet every *possible* contingency of field warfare, we must have a whole arsenal of weapons with an army in the field. He lays stress on the opinion that the objections to a "universal" or "general utility" gun are based on the properties of existing guns and ammunition. The impotence of these against regular earthworks was dearly learnt by the Russians in the Russo-Turkish campaign, but the introduction of high explosives for shells will materially alter the powers of field artillery in this respect, and

there is little reason to doubt that in the near future we shall possess shells which will make light of all possible spade-work in the field. Even in the existing state of artillery science, it is surely better to trust to the possibility of borrowing suitable guns from the siege trains to meet special emergencies than to arm our field artillery with hermaphrodite weapons—half guns, half howitzers.

The "Gun of the Future" to be a Q.F. Gun.—Lastly, General Wille's "gun of the future" is to be almost a Q.F. gun, *i.e.*, its recoil is not to exceed one yard. He looks to the further development of artillery science to overcome the two principal objections to the principle of Q.F. guns, *i.e.*, the dense smoke and the recoil. The former has already been practically obviated by the introduction of smokeless powders. The latter Wille proposes to remedy by the reduction of calibre and by his longer lighter shells.

The pros and cons of the Q.F. principle for field guns Wille touches on somewhat lightly, more so than on any other point connected with his proposed gun of the future.

Such are the views propounded by General Wille in the theoretical portion of his essay on the "Field Gun of the Future." Before referring to the many German and foreign criticisms he has evoked, it will be as well to summarize in tabular form the particulars of this ideal weapon.

1. *Gun and Wagon.*

For horse or field batteries.	A universal gun, calibre 2·756, I.V. at least 2,625 ft.-sec.
	Weight of gun, 7·85 cwt.
	„ carriage without gun, 10 cwt.
	„ limber complete, 15·7 to 16·6 cwt.
	Weight of gun and limber complete, 34·3 to 35·3 cwt.
	Draught load per horse, 660 lbs.
	Number of rounds in limber, 30.
	„ men on limber, 4.
	Weight of ditto, 6·1 cwt.
	Weight of gun and limber (with gunners), 41·2 cwt.
	Draught load per horse, 770 lbs.
	Weight of wagon complete, 33·4 cwt.
	Draught load per horse, 550 lbs.
	Number of men carried, 6 or 5.
	Weight of ditto, 8·3 or 7·6 cwt.
	Weight of wagon with gunners, 41·7 or 41·0 cwt.
	Draught load per horse, 800 or 780 lbs.
	Number of rounds per wagon, 72.
Horse artillery batteries.	Weight of gun and carriage, 18·6 cwt.
	„ limber complete, 15·7 cwt.
	„ gun and limber, 34·3 cwt.
	Draught load per horse, 640 lbs.
	Weight of wagon, 33·4 cwt.
	Draught load per horse, 620 lbs.
	Number of rounds in limber, 24 } 90.
	„ „ wagon, 66 }

2. *Ammunition.*

Shrapnel and battering shell; weight, 14·3 lbs.
In proportion of $\frac{1}{4}$ to $\frac{1}{3}$ battering to $\frac{3}{4}$ to $\frac{2}{3}$ shrapnel.

3. *Composition of Battery.*

Guns, 6.
Wagons, 9.
Spare carriages, 3.
No forges.

Number of Rounds carried.

In field batteries, 828.
Per gun, 138.
In the fighting line (with 3 or 4 wagons), 396 or 468.

In Horse Batteries with Cavalry Divisions.

Number of rounds, 738.
Per gun, 123.
In the fighting line (with 3 or 4 wagons), 342 or 408.

Such is "the field gun of the future" as advocated by General Wille.

The following are the criticisms, favourable and unfavourable, under each head, of writers in various foreign periodicals.

Weight of Shell.—The French "Revue Militaire" and "Revue d'Artillerie" generally approve the weight and calibre adopted by Wille as sufficiently powerful for field artillery purposes. The latter journal, however, remarks that the weights of all existing field shells give too wide limits for the average to be of any value as a guide, considering, for instance, the very different duties of horse and field batteries, and that it would have been better to take the average of the field battery shrapnel shells of the present day, which would give a weight of 15·9 lbs.

The German "Militär Wochenblatt" thinks the proposed shell too light, and in view of the probable assimilation of weights in the German Army of the shrapnel and common shells (their present weights are 17·7 lbs. and 15·4 lbs. respectively) would take the mean, *i.e.*, 16·5 lbs.

The Russian "Artillery Journal," on the other hand, entirely approves General Wille's shell, which allows of reduction of calibre, reduction of weight of gun, and consequently of a near approach to a Q.F. gun.

Calibre and Initial Velocity.—On these two points, certainly the most important in designing a new gun, General Wille has evoked the strongest criticisms. Captain Moch, in the course of a long article in the French "Revue d'Artillerie," meets him face to face

with the assertion that in these respects his gun is an impossibility. To produce his I.V. of 2,625 ft.-sec., the General requires a muzzle energy of 685 ft.-tons.

Moch argues from Krupp's 3·36-in. gun, with a length of 11·2 ft., which produced a muzzle energy of 648 ft.-tons, that the General's gun, with a calibre of 2·756 in., must have a length of over 13 ft. This gun of Krupp's weighed 20·75 cwt., and proportionally Wille's gun should weigh 12 cwt., instead of the 7·75 cwt. at which he fixes it. This latter weight would entail a strain of 88 ft.-tons per cwt.

It is true that the General relies largely on the results to be obtained from the new powders, new processes of forging guns, new materials for them, and, lastly, on reduction of calibre. But in the opinion of Captain Moch, he has gone to the very extreme in his expectations from each of these. As regards the new powders, they have been the subject of study and experiment for over forty years. And it is impossible to expect any very startling innovation under this head, though improvements in detail are no doubt probable.

The "Militär Wochenblatt" echoes Captain Moch's objections on the same grounds of the General's miscalculation, or, rather, non-calculation, of the energy required to produce his extraordinary I.V.

The Russian critic approves Wille's weight of shell and his calibre, but acknowledges that he has passed by too lightly the difficulties in the way of producing his I.V. under his proposed conditions.

Accuracy.—As General Wille has touched but delicately on this point in connection with his proposed gun, so also have his critics dealt lightly with it. The German "Militär Wochenblatt" and the French "Revue Militaire" accept his claims in silence, except that the latter comforts itself for any possible superiority in a German gun by the reflection that the element of personnel remains the same in all countries, and, consequently, a flatter trajectory and a longer range only render errors in laying and fuze setting more detrimental to effect. Captain Moch apparently contents himself with his exposure of the impossibility of the proposed gun itself, and says nothing on this head. The Russian writer thinks that General Wille has rather shirked this important question, especially as regards the angle of descent at long ranges of the projectiles of his proposed gun, and considers that the omission of any calculation in support of his assertions deprives them of any value.

Number of Kinds of Projectiles.—As regards case shot, the "Revue Militaire" says that the numerous examples quoted by Wille in favour of its abolition only go to prove that it is not often employed, not that it is useless. It has never of recent years been considered as anything but a projectile for use in *emergencies*, and as long as it remains the only projectile for use at close quarters it cannot be abolished. Moch in the "Revue d'Artillerie" does not object to its abolition, but remarks that, in considering its value, only unsuccessful combats should be referred to, and the General is at least wrong in limiting its effects to 400 yds.; the French case shot is effective at nearly double that range. He strongly objects to Wille's proposed shrapnel fuze set normally at 0, as in the hurry of action the setting

of the fuze for longer ranges might be omitted accidentally, and the shell thus burst behind the backs of one's own infantry in front of the guns. The Russian "Artillery Journal" looks on the question of abolishing case shot as on a par with that of side arms for artillery, which are rarely used, but must be provided for cases of emergency.

As regards "battering shells," the Russian critic remarks that it must be remembered that little is known concerning them, the French and German Armies alone have finally adopted them into their equipments, and the secret of their construction and the nature of the bursting charge is jealously guarded, but we may be sure that their value has been fully proved. From what has leaked out on the subject, it appears that the German shell has thick walls, is fitted with a time and percussion fuze, and is designed to act against troops behind cover, rather than against the cover itself. The French shell, on the other hand, has thin walls, a percussion fuze only, and is meant to act as a "fougasse" or mine against the cover itself, resort being had afterwards to shrapnel shell against the personnel of the enemy.

Number of Rounds per Battery.—The Russian critic expresses surprise that Wille, although he proposes his gun as almost a Q.F. gun, pays no attention to the evident necessity connected with the Q.F. principle for a very large increase in the number of rounds carried. This is the more remarkable, as he speaks of it in connection with infantry and the magazine rifle.

Mobility.—The "Revue Militaire" has no serious objections to General Wille's figures under this head, though the number of gunners carried on the limbers in field batteries might have been reduced to three, and more rounds carried. The "impossibility" of Wille's proposed gun, however, deprives of all value his figures on the question of mobility.

"Universal" Gun.—As regards the proposed gun being the "universal" gun, the "Artillery Journal" says that the Germans and Austrians have already adopted the principle (the former in their 8·8-cm., and the latter in their 8·8-cm. guns), but *without discarding* field howitzers and mortars.

The "Revue Militaire" prefers the idea of an universal calibre, which, without forfeiting the advantages of uniformity in ammunition, would allow of horse artillery being armed with a sufficiently light gun, and field artillery with a sufficiently powerful one.

The Q.F. Principle.—The "Revue Militaire" says that, so far, experiments in this direction have not been successful, the recoil can only be overcome by using a light shell of small calibre, and this means loss of power and impossibility of observation of fire. These disadvantages more than counterbalance any advantage in Q.F. guns.

The Russian critic, on the other hand, accepts willingly the Q.F. principle as a necessity in all field guns of the future, subject always to this condition—that their Q.F. qualities should be kept in reserve for emergencies. Their production is only a matter of time. He lays down the following conditions for a Q.F. gun:—

(1) No recoil; (2) laying and loading to be the duties of different numbers at the gun; (3) a traversing arrangement independent of the trail; (4) cartridge shell and fuze in one; (5) a double-action (T. and P.) fuze always in the shell.

Of these, the 1st and 3rd constitute the technical difficulties at present.

A serious objection to the cartridge and shell being in one is that the metal cartridge case represents a considerable amount of dead weight, and is much liable to injury in the limber boxes. It also, in a long-continued action, would be a danger and hindrance to the working of the gun, *i.e.*, the cases would accumulate in heaps on the ground. The adoption of an easily-consumed material (of the nature of celluloid, *e.g.*) might obviate this, or, possibly, powder of the "cordite" description would not require a case at all.

This writer mentions that the Germans, in their experiments with Q.F. guns, have kept the shell separate from the cartridge, which is, however, carried in a metal case.

N.B.—The above criticisms of different foreign journals have reference only to the first or theoretical portion of General Wille's brochure, "The Field Gun of the Future," which is alone under review in the present article.

General Wille has published a second portion of his brochure, containing full details of the construction of his proposed gun and its equipment, which is too technical to be of much interest to the general military reader.

Bearing in mind the general features of this design of an eminent German artillerist, viz., a Q.F. gun 9 ft. 2 in. long, weighing $7\frac{3}{4}$ cwt., and throwing a shell $14\frac{5}{16}$ lbs. with an initial velocity of 2,625 ft.-sec., let us turn to the almost simultaneous proposal of M. de Nordenfelt, also of a Q.F. gun.

Proposed Q.F. Field Gun of M. de Nordenfelt.

Weight of shrapnel shell, 10·34 lbs.
Calibre of gun, 2·95 in.
Initial velocity, 1,474 ft.-sec.

Nordenfelt quotes from various well-known writers, including v. Wille, the opinion that the time has come for a radical change in the armament of artillery of all the great Powers to meet the altered conditions brought about by the introduction of smokeless powders and magazine rifles, and he has no doubt that this change must take the form of Q.F. guns. By the adoption of this principle alone can we satisfy the rival claims of "power" and "mobility." The latter has been more and more sacrificed to the former, and the climax may be said to have been reached in the English 12-pr., with the highest initial velocity of any field gun in Europe, and the greatest "want of mobility."

Conditions of a Q.F. Gun.—Nordenfelt briefly summarizes thus what

he conceives to be the absolutely necessary conditions of an effective Q.F. field gun.

1. Ammunition contained in metal cases containing its own means of ignition, viz., caps like rifle cartridges.

2. A breech-action so rapid as to cause no delay longer than that necessary for laying and adjusting fuzes. This action to be very simple and very strong.

3. The gun carriage to be fitted with elevating and traversing gear, *independent of the trail*, for laying over considerable angles of frontage.

4. Recoil of the gun to entail no recoil of the carriage. Relaying after each round to be unnecessary beyond the slight correction of the displacement due to vibration in rapid firing.

5. The weight of gun, carriage, and limber to be so distributed as to admit of the limber carrying at least 50 rounds.

6. Total weight of gun and limber not to exceed 32·4 cwt., or about 605 lbs. draught load per horse in a six-horse team.

No gun can be called a Q.F. gun that does not absolutely absorb recoil, and, to make up for the lighter weight of the proposed shells as compared with existing shells, the number of rounds carried must considerably exceed the number carried at present.

In designing a new field gun, the weight of the gun itself must be considered for all *practical* purposes, in connection with the weights of its carriage and limber, and this is still more true as regards Q.F. guns, where the weight has to be distributed so as to check recoil.

The initial velocity and "live force" produced in a Q.F. gun must not exceed the resistance of the friction between the carriage and the ground, assisted by artificial means.

In this latter connection numerous expedients have been devised, which have all had serious defects, such as causing "jump," interfering with the laying and working of the gun, &c., and Nordenfelt proposes to find a solution by allowing the gun to recoil *on* its carriage,[1] without entailing recoil of the latter on ordinary ground. In addition the carriage will be fitted with brakes for use on unfavourable ground.

Nordenfelt admits that a carriage under these conditions would not allow of the weight of projectile and I.V. of General v. Wille's gun, but, as will be seen, he proposes to compensate for his light shell by the Q.F. powers of the gun.

Weight of Projectile, I.V., and R.V. of Q.F. Gun.—Assuming the maximum weight of gun and limber for a really mobile gun at 31·4 cwt., Nordenfelt says that in distributing this weight we have a fixed quantity in the weight of the limber decided by conditions of strength and number of rounds carried. The remainder of the total weight is divided between the gun and its carriage, and as much as possible should be allowed for the gun, and that part of the carriage which moves with it.

[1] Probably in the same way as our 12-pr. B.L. carriage, Mark II, which has not been a success.

By using smokeless powders we can obtain an initial velocity of 1,476 ft.-sec., with a maximum bore pressure of 1,800 atmospheres, firing a shell of 10·34 lbs., with a calibre of 2·95 in. A smaller calibre entails, for the same I.V., a greater charge and a longer gun than are suitable for Q.F. guns. The above conditions Nordenfelt says will give R.V. of 787 ft.-sec. at 3,300 yds., and of 623 ft.-sec. at 5,500 yds., with angles of descent respectively of 10° and 20°.

The R.V. here quoted is far less than Wille gives for his proposed gun at the same ranges, and is slightly less than the "Sotomayor" Spanish gun, and the French 8-cm. gun, but at 3,300 yds. is only 32 ft.-sec. less than the English 12-pr. with its far higher I.V.

Nordenfelt quotes various authors in support of the opinion that 5,500 yds. is the extreme range of *useful* artillery fire, owing to impossibility of observation, &c., and also that the introduction of smokeless powders will tend, if anything, to decrease this range rather than to increase it. His weight of shell, 10·3 lbs., is very little less than the average of existing shrapnel for light guns.

Comparing his shell with the French 13·8-pr. (8-cm. gun), he says that the limber of the latter carries 30 rounds: for the same weight of shell the Q.F. 10·3-pr. should carry 25 per cent. more, but he proposes to carry in his limber 48 or 50 rounds.

A heavier shell would, no doubt, with the present bursting charges, be more effective against entrenchments, but with the introduction of "high explosives" for bursting charges, the advantage would probably be with the Q.F. shell.

A considerable advantage is gained by the light shell in the matter of ranging.

A French 8-cm. battery, for instance, using 9 rounds for this purpose, would have expended 125 lbs. of metal, against 93 lbs. with the Q.F. 10·3-pr., a difference of about three shells, which can be usefully expended by the latter after the range is found.

It should be noted here that Nordenfelt is in favour of equipping his Q.F. gun with only shrapnel shells (French "obus à mitraille"), a composition being mixed with the bursting charge, so as to make the shell available for range-finding purposes.

Accuracy.—Nordenfelt does not believe in a useful increase of accuracy from high I.V., using the same arguments on this side of the question that have already been referred to in the criticisms on General Wille's views on this point.

Weight of Cartridges and Cases.—Nordenfelt produces very favourable figures on this head in comparing his gun with General Wille's, which it will be remembered is also to be practically a Q.F. gun. Taking the General's figures, a 14·3-pr. with a 3·6 lbs. charge, he says the complete cartridge will weigh at least 22 lbs.—besides being very long and very expensive. His own cartridge will only weigh 12·5 lbs. Wille's 30 rounds per limber will give only 429 lbs. weight of metal, whereas the Q.F. gun, with the same weight of limber, will have 52 rounds, with a weight of metal of 536 lbs.

Rapidity of Fire.—Nordenfelt refers to the Q.F. fortress gun of 2·24 in., and the naval Q.F. gun of 4·72 in., which have often fired

18 and 10 *aimed* rounds respectively per minute, and deduces that the Q.F. field gun, mounted on a carriage which has no recoil, should easily fire 10 or 12 aimed rounds a minute, against the 2 rounds per minute which represents the rapid *aimed* fire of the present field guns.

Expressing this in weight of metal, a battery of 6 guns would fire in half a minute 6 rounds weighing 83 lbs., against 30 rounds weighing 310 lbs., fired in the same time by the Q.F. battery.

It must be remembered that in neither case is such rapidity of fire likely to be necessary for any length of time, but against the present form of attack employed by infantry, and against cavalry, the advantage gained by the possible rapidity of fire of the Q.F. gun would be very great.

Laying and Ranging.—The effect of all artillery fire depends largely on the rapidity and accuracy of laying. Nordenfelt points out that with the present guns the gun-layer constantly has his attention distracted by his other duties in action, *i.e.*, running up the gun, supervising the adjustment of fuzes, &c. The physical exertion of some of these duties also militates against his laying uniformly and accurately.

With the Q.F. gun, on the other hand, the gun-layer has only to lay and work the firing apparatus. No running up being necessary, he can remain in the same position, with his hands on the elevating and traversing wheels.

Again, in ranging the battery, the commander can, if he wishes, employ only one gun, laid by the same man every time, a great advantage as regards simplicity of command and uniformity of laying.

Adjusting Fuzes.—The difficulty of getting the fuzes adjusted with accuracy during such rapid fire as Nordenfelt asserts to be obtainable will probably occur to most artillery readers. Nordenfelt touches rather lightly on this subject. He says it will probably be necessary to adjust beforehand a certain number of fuzes in the intervals of very rapid fire. He considers fuzes with movable parts which require the operations of screwing and unscrewing (such as our own T. and P. fuze) far inferior to the French and Italian fuzes, which only require to be perforated at the proper hole to be ready for use, and with such fuzes he considers there will be no difficulty in adjusting the fuzes quickly enough for the most rapid fire.

Supply of Ammunition.—Nordenfelt proposes to equip his light Q.F. battery of 6 guns and 9 wagons with 1,638 rounds, or 273 per gun, carried as follows:—

6 limbers at 48 rounds	= 288
9 wagon limbers at 48 rounds ..	= 432
9 „ bodies at 102 rounds ..	= 918
	1,638

As compared with—

French 8-cm. gun (9 wagons)	936	rounds.
Spanish (Sotomayor 7·85-cm.) (6 wagons)	648	,,
Swedish 7·5-cm. (8 wagons)	1,122	,,
German 8·8-cm. (8 wagons).....	808	,,
English 12-pr. B.L. (6 wagons).....	648	,,

Note.—Of these the French, Swedish, and German guns have apparently four boxes on the wagon bodies, the remainder only two.

Nordenfelt speaks of boxes each containing six rounds, and completely interchangeable, which can be carried on a man's arm; but it is not clear whether these are the actual ammunition boxes or "portable magazines" after the German fashion, which fit, with the rounds ready in them, into the ammunition boxes on the limbers and wagons.

This latter plan is far preferable to our own portable magazines, as the ammunition can be replaced far quicker when the battery changes ground. Nordenfelt strongly favours the abolition of case shot, and, as has been said before, the retention of shrapnel only as the projectile for field artillery.

Shields.—Nordenfelt recommends the adoption of gun shields for the protection of the detachments, but does not propose any particular pattern of his own invention.

Reduction of Number of Guns per Battery.—The introduction of a Q.F. gun gives a new aspect to this question. With the present guns, six has been generally admitted to be the *minimum* to produce sufficient fire effect, and to enable ranging to be carried out rapidly, and the *maximum* to allow of facility of manœuvre.

But as the rapid fire of four Q.F. guns is more than equal to that of six of the existing guns, as regards weight of metal thrown in a given time, and the ranging can be better carried out by a single Q.F. gun, Nordenfelt considers that the advantages of greater intervals between the guns, smaller target in men and horses, and less frontage of a line of batteries, point to the adoption of four-gun batteries. Moreover, the reduction of two guns allows of the adoption of two more wagons without increasing the depth of the column of route beyond the existing figure. These eleven wagons would bring the total number of rounds carried with a battery up to 1,842, or 640 rounds per gun, almost the *total equipment* of an *English* 12-*pr.* battery of six guns.

The remainder of Nordenfelt's essay is taken up with suggestions as to the tactical employment of the proposed Q.F. guns, and is beyond the scope of the present article.

In these pages, however, occur some figures relating to the fire effect of the new guns which are worth quoting.

Cavalry attacking a battery pass over 330 yards in a minute during their advance. Nordenfelt claims that during this minute each gun can easily fire 10 to 15 rounds, or 60 to 90 per battery of 6 guns.

His 10·3-lb. shrapnel shell will contain 120 bullets, so that from 7,200 to 10,800 bullets will be fired at the cavalry during their advance over 330 yards. A French 8-cm. battery would fire 18

rounds, or 2,916 bullets in the same time. Again, infantry advancing by rushes of half a minute duration would be met by a fire of at least 30 rounds in that time from a 6-gun Q.F. battery against 6 rounds from the 8-cm.

The advantage, as has been shown, of the heavier shell with higher I.V. is rather in the length than the width of the cone of bullets after burst, and would show itself rather against columns than against lines.

In prolonged fighting, the expenditure of ammunition is much in favour of the Q.F. gun. An expenditure of thirty rounds per gun with the 8-cm. empties the limber boxes, and means an expenditure of nearly one-fifth of the total ammunition of the battery. A similar expenditure with the Q.F. gun leaves 108 rounds in the limbers, and only one-ninth of the total ammunition has been fired.

Conclusion.

Such, then, are the two most distinct types of the field gun of the future which have yet been put before the military public. It will be observed that both writers agree in the necessity for a bold departure, a complete rearmament of field artillery, to meet the requirements of new tactical conditions; not a very comforting idea to us, who have just been congratulating ourselves on having rearmed, or nearly rearmed, our artillery with "the best field gun in Europe."

Both writers, too, agree in the necessity for the adoption, in some form or other, of the Q.F. principle; and this again is very disquieting for us; for, though it is an open secret that the 12-pr. B.L. in its present form, having utterly failed in mobility, at least as a horse artillery gun, is to be supplemented as speedily as possible by a lighter gun with a weight behind the horses not exceeding 33 cwt., there is no rumour so far of the Q.F. principle being adopted.

Both of the guns described in this article will no doubt find many critics among our own artillerists, scientific and practical, and no one probably will read the arguments of the authors themselves without feeling that they have both passed by too lightly some of the most serious objections to their proposed guns.

Accepting both guns as possible under the conditions laid down by their authors, it may be stated without hesitation that Nordenfelt's Q.F. 10·3-pr. presents by far the more attractive picture of the two to the field artilleryman, who has to think not only of the possible effect of his gun on the battlefield, but of the difficulties of getting it there, with all its accessories of men, horses, and ammunition, and of working it when there, under all conditions of ground and weather. Few artillery Officers of our Service, who have served with 12-pr. batteries of recent years at manœuvres in England and India, will think without a shudder of Wille's 9-ft. gun with its complicated carriage, even with its great advantages over the 12-pr. of some 5 or 6 cwt. less weight behind the horses and more liberal supply of ammunition. There is also among us a widespread feeling of aversion in principle and practice to these enormous initial

velocities, to which so much has been sacrificed. On the other hand, it may be said that English artillery Officers have always had an instinctive dislike to anything in the shape of a "machine gun," which a Q.F. gun undoubtedly is, although the two terms have of late years been generally accepted as applying to infantry and artillery weapons respectively; and a Q.F. field gun would have to stand very severe tests to bring it into favour. Granting, however, the possibility of overcoming all possible objections on this head, the weights and the generous supply of ammunition of Nordenfelt's gun are surely very attractive.

Fuller and more scientific criticisms of both Wille's and Nordenfelt's proposals will probably appear before long in our own military periodicals; the object of the present article has been only to present to the general military reader some idea of the direction in which military thought on the Continent on this important subject of "Field Artillery of the Future" is now tending.

[*Author's Note.*—The arguments and figures produced in this article relating to General Wille's gun have been taken by me at second hand from the very long article entitled "Field Artillery of the Future" which has appeared in successive numbers of the Russian Artillery Journal during the present year. My ignorance of the German language has prevented my producing them at first hand, and I must plead this excuse for any errors that may do injustice to the conclusions of the distinguished author of "Das Feldgeschütz der Zukunft."—E. L.]

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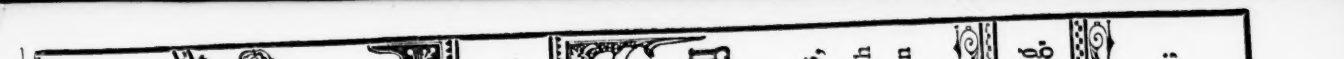

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11th	Lieut. S. N. Bavington ...	2,893
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9th	C. D. Christopher ...	1,881
	A. R. C. Savile ...	1,881
12th	A. J. Lean	1,876
15th	D. J. Prepero ...	1,868
17th	*R. H. Hunter Weston ...	1,850
20th	E. C. F. Wodehouse ...	1,825
24th	W. Marriott Dolington ...	1,806
21th	R. G. T. Bright	1,795
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